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**1995**

**PERFORMANCE REPORT**

**WATER QUALITY ANALYSES SECTION**

**OCTOBER 1996**

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**Ministry of  
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**1995**

**PERFORMANCE REPORT**

**WATER QUALITY ANALYSES SECTION**

Susan Janhurst (ed.)

Laboratory Services Branch

Ontario Ministry of the Environment and Energy

October 1996

## INTRODUCTION

The Water Quality Analyses Section (WQAS) is part of the Ministry of the Environment and Energy's Laboratory Services Branch. The WQAS provides expertise in inorganic chemistry and handles the largest number of tests in the branch. Technologists analyze a broad spectrum of environmental sample types including: ground water, surface water, drinking water, precipitation, sewage, industrial waste, landfill leachate, soil and soil extract.

This report provides a brief outline of the analytical quality control (QC) program associated with sample analysis and, summarizes the 1995 performance data for each test. WQAS strives to maintain a high standard of analytical performance through its quality assurance program and QC is an integral part of the process.

## ACKNOWLEDGEMENTS

The editor would like to thank the technical staff in the Water Quality Analyses Section for their assistance in Quality Control data collection and summaries.

## TABLE OF CONTENTS

<b>PART 1.0 Performance Report Format</b> .....	1
<b>PART 2.0 Chemistry</b> .....	4
2.1 Quality Control Program, Chemistry .....	4
2.2 Performance Summaries, Chemistry .....	8
<b>Acidity, Gran</b>	
Titration (E3248A) .....	9
<b>Acidity, Total Fixed Endpoint</b>	
Titration (E3248A) .....	12
<b>Alkalinity, Gran</b>	
Dorset (E3042A) .....	15
<b>Alkalinity, Total Fixed Endpoint 4.5</b>	
Dorset (E3042A) .....	18
Titration (E3218A) .....	21
Titration (E3228A) .....	24
Titration (E3289A) .....	27
<b>Alkalinity Total Fixed Endpoint 3.8</b>	
Dorset (E3042A) .....	30
<b>Aluminum, Reactive Species</b>	
Dorset (E3375A) .....	33
<b>Aluminum, Total</b>	
Dorset (E3300A) .....	38
<b>Cadmium, Total</b>	
Dorset (E3376A) .....	41
<b>Calcium</b>	
Atomic Absorption (E3146A) .....	44
Atomic Absorption (E3171A) .....	47
Atomic Absorption (E3217A) .....	50
Dorset (E3249A) .....	53
<b>Carbon, Dissolved Inorganic</b>	
Dorset (E3028A) .....	56
Colourimetry (E3370A) .....	59
<b>Carbon, Dissolved Organic</b>	
Colourimetry (E3370A) .....	62
<b>Carbon, Total Organic</b>	
MISA (E3247B) .....	65
<b>Carbon, Total Particulate</b>	
MISA (E3141A) .....	68
<b>Chloride</b>	
Colourimetry (E3016A) .....	71
Dorset (E3147A) .....	74
Ion Chromatography (E3148A) .....	77
Ion Chromatography (E3372A) .....	80
<b>Chlorine, Total Residual</b>	
MISA (E3309A) .....	83
<b>Chlorophyll "a"</b>	
Colourimetry (E3169A) .....	86

## TABLE OF CONTENTS CONT'D

<b>Chlorophyll "a"acidified</b>	
Colourimetry (E3169A) .....	89
<b>Chlorophyll "b"</b>	
Colourimetry (E3169A) .....	91
<b>Colour, True</b>	
Dorset (E3025A) .....	93
Colourimetry (E3219A) .....	96
<b>Conductivity</b>	
Dorset (E3024B) .....	99
Ion Chromatography (E3177A) .....	102
Titration (E3218A) .....	105
Titration (E3228A) .....	108
Titration (E3289A) .....	111
<b>Copper, Total</b>	
Dorset (E3376A) .....	114
<b>Cyanide, Free</b>	
Colourimetry (E3014A) .....	117
<b>Cyanide, Total</b>	
Colourimetry (E3015A) .....	120
<b>Fluoride</b>	
Dorset (E3041A) .....	123
Colourimetry (E3369A) .....	126
<b>Hardness</b>	
Atomic Absorption (E3171A) .....	129
Atomic Absorption (E3217A) .....	130
Dorset (E3249A) .....	131
<b>Iron, Total</b>	
Dorset (E3303B) .....	132
<b>Lead, Total</b>	
Dorset (E3376A) .....	135
<b>Magnesium</b>	
Atomic Absorption (E3146A) .....	138
Atomic Absorption (E3171A) .....	141
Atomic Absorption (E3217A) .....	144
Dorset (E3249A) .....	147
<b>Manganese, Total</b>	
Dorset (E3303B) .....	150
<b>Nitrogen, Ammonia plus Ammonium</b>	
Colourimetry (E3149A) (mg/L) .....	153
Colourimetry (E3364A) .....	156
Colourimetry (E3366A) .....	159
Dorset (E3374A) .....	162
<b>Nitrogen, Nitrate</b>	
Ion Chromatography (E3148A) .....	165
Ion Chromatography (E3372A) .....	169

## TABLE OF CONTENTS CONT'D

<b>Nitrogen, Nitrate plus Nitrite</b>	
Colourimetry (E3364A) .....	172
Colourimetry (E3366A) .....	175
Colourimetry (E3369A) .....	178
Dorset (E3374A) .....	181
<b>Nitrogen, Nitrite</b>	
Colourimetry (E3364A) .....	184
Colourimetry (E3366A) .....	187
<b>Nitrogen, Total Kjeldahl</b>	
Colourimetry (E3116A) .....	190
Colourimetry (E3118A) .....	193
Colourimetry (E3367A) .....	196
Colourimetry (E3368A) .....	199
<b>Oxygen Demand, Biochemical</b>	
BOD (E3182A) .....	202
<b>Oxygen Demand, Chemical</b>	
Colourimetry (E3170A) .....	206
Colourimetry (E3246A) .....	209
<b>pH</b>	
Dorset (E3042A) .....	212
Titration (E3218A) .....	215
Titration (E3228A) .....	218
Titration (E3248A) .....	221
Titration (E3289A) .....	224
<b>Phenolics, Reactive</b>	
Colourimetry (E3179A) .....	227
<b>Phosphorus, Reactive ortho-Phosphate</b>	
Colourimetry (E3364A) .....	230
Colourimetry (E3366A) .....	233
<b>Phosphorus, Total</b>	
Dorset (E3036A) .....	236
Colourimetry (E3116A) .....	239
Colourimetry (E3118A) .....	242
Colourimetry (E3367A) .....	245
Colourimetry (E3368A) .....	248
<b>Potassium</b>	
Atomic Absorption (E3146A) .....	251
Atomic Absorption (E3171A) .....	254
Atomic Absorption (E3217A) .....	257
Dorset (E3249A) .....	260
<b>Silicon, Reactive Silicates</b>	
Colourimetry E3370A) .....	263
<b>Sodium</b>	
Atomic Absorption (E3146A) .....	266
Atomic Absorption (E3171A) .....	269
Atomic Absorption (E3217A) .....	272
Dorset (E3249A) .....	275

## TABLE OF CONTENTS CONT'D

<b>Solids, Dissolved</b>	
Solids (E3188B) .....	278
River Solids (E3365A) .....	281
<b>Solids, Suspended</b>	
Solids (E3188B) .....	284
River Solids (E3365A) .....	287
<b>Solids, Suspended Ignited (Particulate Ash and Particulate Loss on Ignition)</b>	
Solids (E3188B) .....	290
<b>Solids, Total</b>	
Solids (E3188B) .....	294
Solids (E3365A) .....	298
<b>Solids, Total Ignited (Ash and Loss on Ignition)</b>	
Solids (E3188B) .....	301
<b>Sulphate</b>	
Dorset (E3147A) .....	305
Ion Chromatography (E3148A) .....	308
Ion Chromatography (E3172A) .....	313
Ion Chromatography (E3372A) .....	316
<b>Turbidity</b>	
Colourimetry (E3311A) .....	319
<b>Zinc, Total</b>	
Dorset (E3376A) .....	322
<b><u>Bibliography</u></b> .....	325
<b>Abbreviations</b> .....	326
<b>Appendix A (W and T Reporting)</b> .....	328
<b>Appendix B (Table of Tests)</b> .....	329

## 1.0 PERFORMANCE REPORT FORMAT

The performance report consists of two sections. Section 1 provides details on the report structure, Section 2.0 briefly outlines the Quality Control Program (Section 2.1) and provides the annual quality control data performance summaries for WQAS chemistry tests (Section 2.2). Parameters where no data or less than three pieces of data exist for 1995 are not included. The summary report usually comprises three pages: the test description, the performance data, and the quality control graphics pages.

The performance report is organized first, alphabetically according to test name (eg. Total Organic Carbon is filed under the heading "Carbon, Total Organic") and second, by the method reference number. Detailed information concerning each of these pages is outlined next.

### 1.1 TEST DESCRIPTION PAGE

TITLE: The name of the test parameter.

#### IDENTIFICATION

Laboratory Unit:	Location where the test is performed.
Method Reference No:	A number assigned by the Quality Management Unit to an analytical test method eg.(E3228A). E3 denotes a Central Regional Lab test method. The subsequent three numbers are issued sequentially per method. A letter at the end denotes revision status.
LIMS Product Code:	LIMS code for analysis request.
Sample Type/Matrix:	The various sample types that can be routed to the Department.
Method Introduced:	Date that the method was implemented at the laboratory.
Units:	Unit of measurement in which the results are reported.
Supervisor:	Name of supervisor responsible for the method.

SAMPLING: The type of container and preservative (if applicable) that is used and minimum volume of sample that is usually required (7). Any sample preparation that is normally performed in the field, is also indicated.

SAMPLE PREPARATION: Sample preparation techniques which are usually performed at the laboratory before analysis.

ANALYTICAL PROCEDURE: Analytical method used to determine the parameter.



INSTRUMENTATION: Type of instrumentation, used to perform the test. Automated continuous flow systems, consist of a sampler, peristaltic pump, manifold for reagent addition, detection system and readout system. Microcomputers are used to control the operation of analytical equipment and/or data acquisition.

REPORTING: W and T are low level data qualifiers assigned to data that are near or below the detection limit values (3)(5). The code <W indicates that no measurable response was observed under the test conditions. The value reported indicates the minimum amount of analyte measured under routine conditions. W is usually less than the standard deviation of duplicates near zero. The code <T is used to represent a measurable amount of the analyte which under the test conditions is not verifiable. The reported result should be used only for large batches of similar data to evaluate background levels or trends of contaminants in the environment where more sensitive analytical methods are not available.

To provide a consistent Laboratory Services Branch approach to data reporting, the Water Quality Section calculates W from the standard deviation of duplicates ( $S_2$ ), near zero, by rounding down to the nearest 1,2 or 5 digit. T is five times W. The latest calculations, valid at date of publication for W and T values of all active methods, are contained in this report (APPENDIX B).

Data is reported to a maximum of three significant figures to the nearest W, unless stated otherwise.

CALIBRATION: The number of standards used to calibrate the analytical system plus blanks if applicable.

CONTROLS: The calibration, drift, recovery, and interference controls that are used when applicable to ensure that the system is operating properly.

MODIFICATIONS: Modifications made to the test in 1995.

NOTES: Explanatory notes which may aid the data user in interpreting results and information.

## 1.2 PERFORMANCE DATA SUMMARY PAGE

TITLE: The name of the test parameter.

QUALITY CONTROL DATA FROM/TO: The period of time over which data were collected.

LAB: The laboratory in which the data was collected.

ANALYTICAL RANGE/ REPORTING UNITS: The full scale value for the analytical range is given with reporting unit.

CALIBRATION CONTROL: A summary table for the calibration control standards data. The between run standard deviation (S), the within run standard deviation ( $S_w$ ), the ratio  $S/S_w$ , and the ranges for acceptance limits of the control standards sums and differences are included.

RECOVERIES (Where applicable): A summary table for the recovery control standards data.

DUPLICATES: A summary table of within run duplicate data is sorted into a number of concentration spans (generally 10-20, 20-50 and 50-100 percent of full scale). The coefficient of variation (%) is obtained by dividing the mean standard deviation ( $S_2$ ) for a particular concentration span by the mean concentration of duplicate results in that span and multiplying by 100.

OTHER CHECKS (Where applicable): A summary table for other data checks.

### 1.3 QUALITY CONTROL GRAPHICS PAGE

TITLE: The name of the test parameter and reporting unit of measurement.

DATE FROM/TO: Period of time over which data were collected.

CALIBRATION CONTROL: Calibration control standards sums and differences are plotted on a horizontal scale for the defined period of data collection (referred to on the graphs as ie., "QUALITY CONTROL STANDARD A+B"). The control limits are indicated on either side of the expected value.

## 2.0 CHEMISTRY

### 2.1 Analytical Quality Control Program

Quality control is a continuous process that involves constant checks of sample processing. This report summarizes the QC data collected during analytical processing to monitor performance of the analytical system.

Calibration is conducted by analyzing a series of calibration standards covering the analytical range. Since a high degree of both precision and accuracy is required to detect and minimize any between-run changes, the standards are analyzed with as little handling as possible.

Once a system has been calibrated, quality control begins. Depending on the analytical procedure, quality control may be used to evaluate: calibration, blank, recovery, sensitivity, potential interference, and sample repeatability.

#### Calibration and Blank

Calibration is controlled by a minimum of two quality control standards and a long term blank which are prepared and maintained independently of the calibration standards. The system is not calibrated with the quality control standards. The long term blank is prepared identical to the quality control standards but with zero concentration of the analyte. Control standards are prepared less frequently than calibration standards and errors in newly prepared calibration standards can be detected by this cross check. Newly prepared control standards are run in parallel with the old control standards and must meet control requirements over three consecutive runs before the new standards are accepted on line.

The standard deviation of the control standards is used to estimate the between run standard deviation ( $S$ ) and is compared against the within run standard deviation ( $S_w$ ). If the ratio  $S/S_w$  exceeds 1.5 then poor control of systematic error can be inferred (1). Values for  $S$  and  $S_w$  are calculated as follows:

$$2S^2 = (S_A)^2 + (S_B)^2 \qquad 2S_w^2 = (S_{A-B})^2$$

Where:

$S_A$  = standard deviation of control standard A  
 $S_B$  = standard deviation of control standard B  
 $S_{A-B}$  = standard deviation of the difference between control standards A and B

NOTE: If a second range is employed for a test, more control standards

are used because, in many systems, the between run standard deviations are concentration dependent.

Detailed description of the quality control processes are outlined in several LSB reports (1)(2)(3).

#### Control and Warning Limits

The control standards data are assessed and compared against the control limits established from previous data to determine whether the calibration process is in control as defined in the method. The control limits are examined yearly and may be adjusted if the method performance improves and/or the historical data base is increased. Control and warning limits are calculated for the sums and differences of control standards (A,B,C,D) by the equations:

Applies to Control Standards	Warning Limit	Control Limit
A+B	$2.0 \times S_{A-B}$	$4.0 \times S_{A-B}$
B+C	$2.0 \times S_{B-C}$	$4.0 \times S_{B-C}$
C+D	$2.0 \times S_{C-D}$	$4.0 \times S_{C-D}$
A-B	$2.0 \times S_{A-B}$	$3.0 \times S_{A-B}$
B-C	$2.0 \times S_{B-C}$	$3.0 \times S_{B-C}$
C-D	$2.0 \times S_{C-D}$	$3.0 \times S_{C-D}$

If a control limit is exceeded, the analysis is stopped, corrective action taken and the control standards are re-analyzed. If warning limits are exceeded continually a developing problem may be investigated. All aspects of the calibration process, reagents and standards are examined.

#### Recovery Standards

Some methods require sample pre-treatment, such as digestion or extraction. A recovery check, suitable to that method, is required to estimate the efficiency of the pre-treatment. Recovery standards are usually prepared at 0%, 20% and 80% of full scale. The solutions are analyzed in the same manner as routine samples. Although these solutions are not used to calibrate the instrument, corrections for the blank and matrix effects are calculated and applied if necessary. The method defines the acceptance limits for recovery standards and the long term blank.

#### Sensitivity and Baseline

Any change in the sensitivity of the instrumentation is monitored periodically by analyzing a standard that is usually 80% of full scale, and comparing the peak height to the original calibration standards. Baseline drift is usually recorded by periodic analysis of pure deionized water (Pure-DW) which does not contain any of the analyte, but may be adjusted to correspond to sample pre-treatment.

### Interference Check

Some methods require an interference check which is prepared near the threshold concentration, beyond which the methodological safeguards used to minimize the interference is no longer effective. These checks indicate that the interference has no effect up to the specified concentrations.

### Sample Repeatability

Generally, one sample out of twenty is run in duplicate up to a maximum of three per day. The samples are selected for non-adjacent, within-run duplicate analyses. By analyzing samples in duplicate, the ability of the analyst to obtain repeatable analytical results, within an analytical run, can be determined. For results to be acceptable, at least two-thirds of the duplicate data must conform to limits which are based on historical performance.

The observed differences in duplicate results are accumulated and sorted according to sample concentration span. A standard deviation is calculated for each sample concentration span. The algorithm differs from the conventional standard deviation as follows:

Conventional Standard  
Deviation (1)\*

$$S_1 = \sqrt{\frac{\sum_{i=1}^n (\bar{x} - x_i)^2}{n-1}}$$

Standard Deviation of  
Duplicates (2)\*

$$S_2 = \sqrt{\frac{\sum_{i=1}^{n'} (x_1 - x_2)_i^2}{2n'}}$$

\* Standard deviations used for the data summaries.

Where:

$S_1$  = sample standard deviation

$S_2$  = duplicate difference standard deviation

$n$  = number of data

$\bar{x}$  = mean of data

$x_i$  =  $i^{\text{th}}$  result

$(x_1 - x_2)_i$  = difference of the  $i^{\text{th}}$  duplicate

$n'$  = number of duplicate pairs

Reported values for duplicate standard deviations have been treated by robust statistical methods (5)(6). The standard deviation ( $S_2$ ) of the duplicate difference is also expressed as the coefficient of variation (CV) using the untreated standard deviation.

$$CV = \frac{S_2}{\bar{X}} \times 100$$

## ACIDITY, GRAN

### IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	01/08/82
Method Reference No	E3248A	Units	$\mu\text{g/L as H}^+$
LIMS Product Code	PHACD3248	Supervisor	F. Lo
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

### SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

Sample aliquots (10.0 mL) are titrated with 0.01 N sodium hydroxide to pH >8.3. The titrant is standardized against 0.0005 N potassium hydrogen phthalate. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH readings following each aliquot of titrant. Data are subjected to Gran analysis.

pH and total fixed endpoint acidity are determined simultaneously.

### INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
--------------------------------	--------------------	--------------------

### CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

### CONTROLS:

Calibration	LTBL (expected result is $16.6 \mu\text{g/L as H}^+$ ) plus 2 standards, e.g. QCA
-------------	---

# ACIDITY, GRAN

QUALITY CONTROL DATA FROM 04/01/95 TO 20/10/95

Laboratory Unit: Titration

Analytical Range: to 1000 µg/L as H<sup>+</sup>

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	17	500.0	501.3	1.3	3.3868
B:	17	200.0	201.5	1.5	2.2945
A+B:	17	700.0	702.8	2.8	5.0315
A-B:	17	300.0	299.8	-0.2	2.8556

s.d.(AB) S(between runs): 2.89

Sw(within run): 2.02

S/Sw: 1.4

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

662 - 738 for A+B  
272 - 328 for A-B

## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
42	0 - 200	2.2779	3.4
0	201 - 500	N.A.	N.A.
0	501 - 1000	N.A.	N.A.
42	Overall	2.2779	

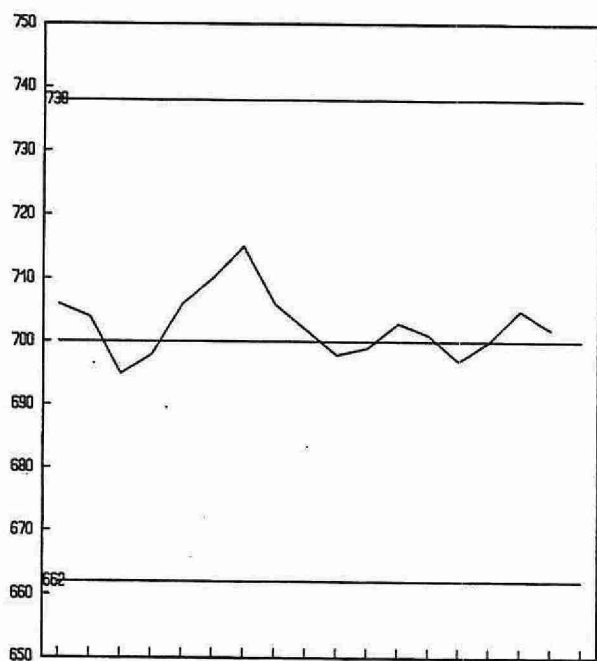
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	16	13.1	2.2593

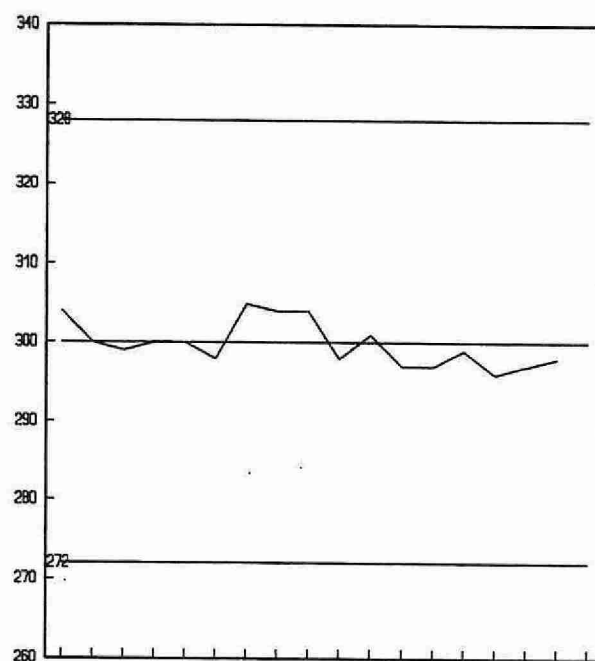


ACIDITY, GRAN ( $\mu\text{g/L}$  as  $\text{H}^+$ )

QUALITY CONTROL DATA FROM 04/01/95 TO 20/10/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## ACIDITY, TOTAL FIXED ENDPOINT

### IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	01/08/82
Method Reference No.	E3248A	Units	mg/L as CaCO <sub>3</sub>
LIMS Product Code	PHACD3248	Supervisor	F. Lo
Sample Type/Matrix	Precipitation, Throughfall, Stemflow, Domestic Waters, Rivers, Lakes (by special request: Industrial Waste, Sewage)		

### SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

Sample aliquots (10.0 mL) are titrated with 0.01 N sodium hydroxide to pH >8.3. The titrant is standardized against 0.0005 N potassium hydrogen phthalate. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH readings following each aliquot of titrant. pH and gran acidity are determined simultaneously.

### INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
--------------------------------	-----------------------	-----------------------

### CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
-------------	---------------------------------

# ACIDITY, TOTAL FIXED ENDPOINT

QUALITY CONTROL DATA FROM 04/01/95 TO 20/10/95

Laboratory Unit: Titration

Analytical Range: to 100 mg/L as CaCO<sub>3</sub>

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	17	25.0	25.10	0.10	0.1595
B:	17	10.0	10.13	0.13	0.1135
A+B:	17	35.0	35.23	0.23	0.2382
A-B:	17	15.0	14.97	-0.03	0.1411

s.d.(AB) S(between runs): 0.14

Sw(within run): 0.10

S/Sw: 1.4

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

32.8 - 37.2 for A+B  
13.4 - 16.6 for A-B

## DUPLICATES:

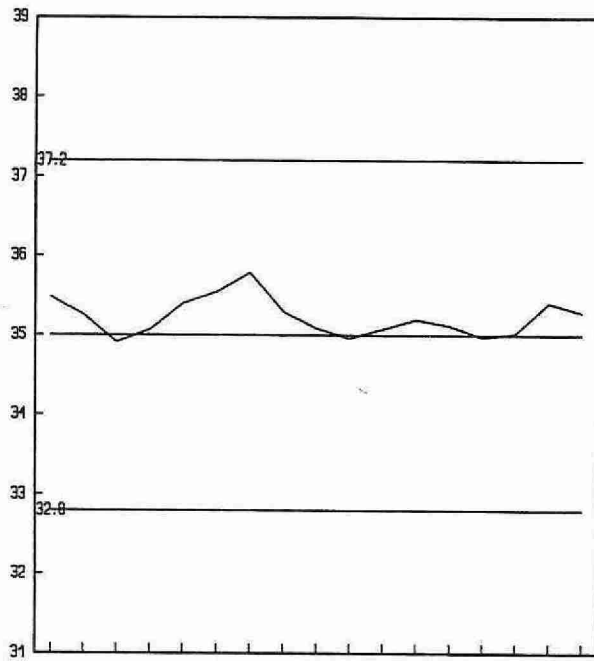
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
42	0.0 - 20.0	0.1098	3.0
0	20.1 - 50.0	N.A.	N.A.
0	50.1 - 100.0	N.A.	N.A.
42	Overall	0.1098	

## OTHER CHECKS:

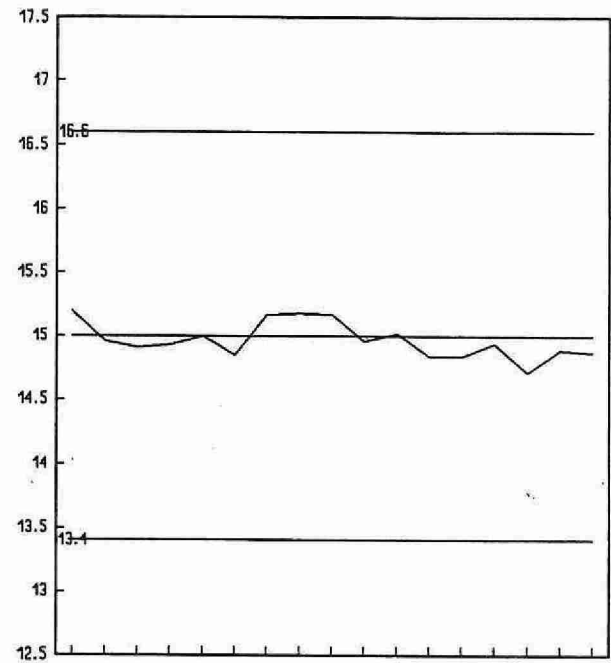
	n	Mean	Standard Deviation (1)
Long Term Blank	16	0.6819	0.0925

ACIDITY, TOTAL FIXED ENDPOINT (mg/L as CaCO<sub>3</sub>)

QUALITY CONTROL DATA FROM 04/01/95 TO 20/10/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## ALKALINITY, GRAN

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	26/07/79
Method Reference No.	E3042A	Units	mg/L as CaCO <sub>3</sub>
LIMS Product Code	PHALK3042	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation, Groundwaters		

### SAMPLING:

Quantity Required:	150 mL
Container:	250 mL Amber polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred.

### ANALYTICAL PROCEDURE:

Samples (100 mL) are weighed (volume = weight), and titrated with 0.02 N sulphuric acid to a pH <3.7. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant. Data are subjected to Gran analysis.  
N.B. pH is determined simultaneously.

### INSTRUMENTATION:

Semi-automated modular titration system with microcomputer control and data reduction software.

### REPORTING:

Maximum Significant Figures: 3

### CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

### CONTROLS:

Calibration	LTBL plus 4 standards, e.g. QCA
Drift	2 standard buffers - 2 times daily

# ALKALINITY, GRAN

QUALITY CONTROL DATA FROM 02/01/95 TO 22/12/95

Laboratory Unit: Colourimetry

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	124	20.0	19.993	-0.007	0.2812
B:	124	5.0	5.012	0.012	0.2082
C:	124	-5.0	-4.910	0.090	0.1746
D:	124	-1.25	-1.222	0.028	0.1779
A+B:	124	25.0	25.004	0.004	0.3721
A-B:	124	15.0	14.981	-0.019	0.3263
C+D:	124	-6.25	-6.131	0.119	0.3212
C-D:	124	-3.75	-3.688	0.062	0.1451

s.d.(AB) S(between runs): 0.25

Sw(within run): 0.23

S/Sw: 1.1

s.d.(CD) S(between runs): 0.18

Sw(within run): 0.10

S/Sw: 1.7

The calibration is accepted if the calibration control values obtained lie within the ranges:

24.0	-	26.0	for	A+B
14.0	-	16.0	for	A-B
-8.89	-	-3.61	for	C+D
-5.73	-	-1.77	for	C-D

## DUPLICATES:

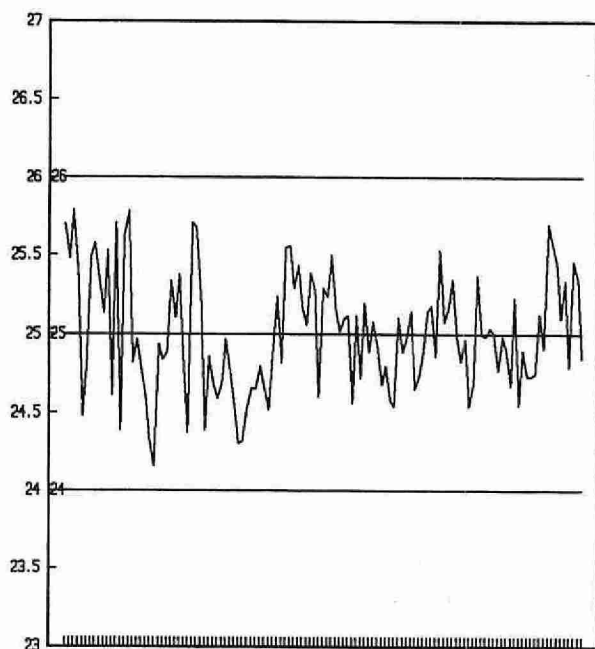
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
274	-5.0 - 30.0	0.0928	7.4
3	30.1 - 60.0	0.4035	0.7
27	60.1 - 150.0	1.6710	1.6
65	151 - 300	2.5894	2.6
369	Overall	0.2689	

## OTHER CHECKS:

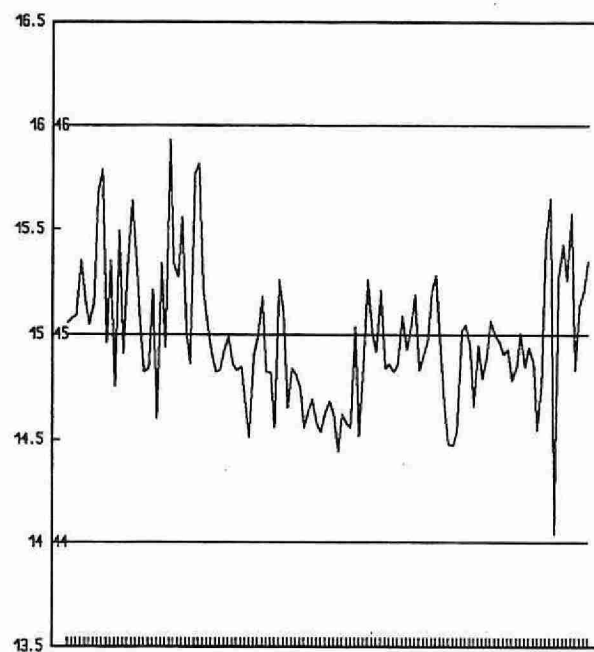
	n	Mean	Standard Deviation (1)
Long Term Blank	124	-0.0903	0.1443

# ALKALINITY, GRAN (mg/L as $\text{CaCO}_3$ )

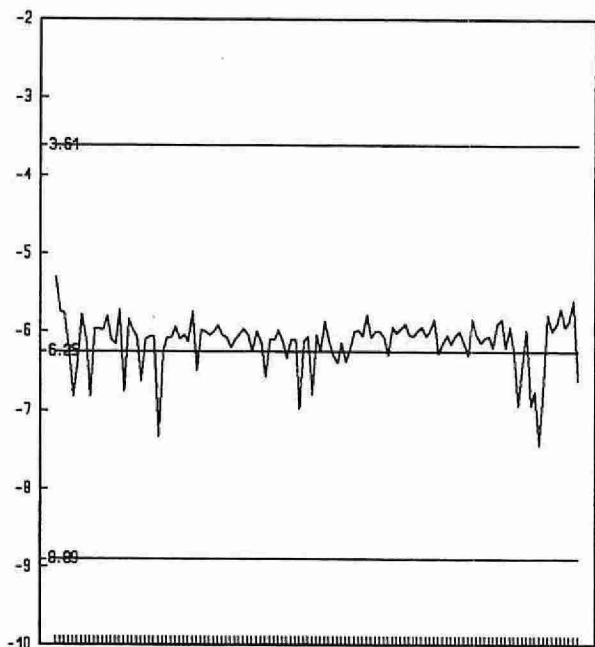
QUALITY CONTROL DATA FROM 02/01/95 TO 22/12/95



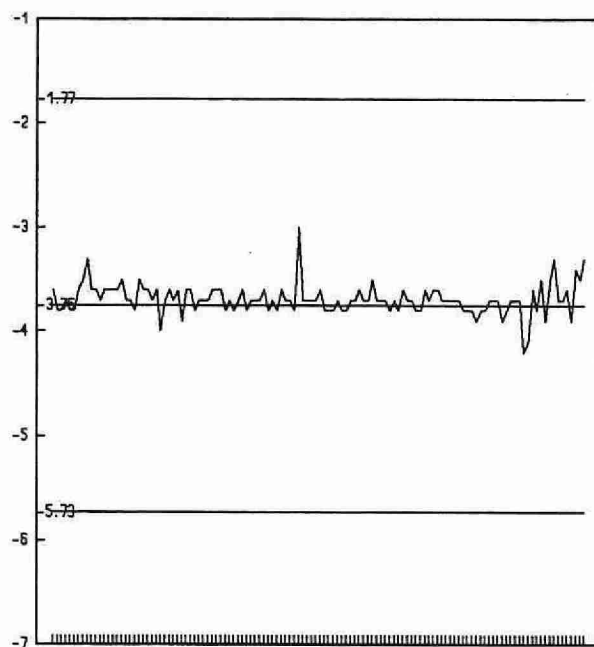
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

CONTROL LIMIT

## ALKALINITY, TOTAL FIXED ENDPOINT

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	26/07/79
Method Reference No.	E3042A	Units	mg/L as CaCO <sub>3</sub>
LIMS Product Code	PHALK3042	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation, Groundwaters		

### SAMPLING:

Quantity Required:	150 mL
Container:	250 mL Amber polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred.

### ANALYTICAL PROCEDURE:

Samples (100 mL) are weighed (volume = weight), and titrated with 0.02 N sulphuric acid to a pH 4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant.

### INSTRUMENTATION:

Semi-automated modular titration system with microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	2 standard buffers - once daily



# ALKALINITY, TOTAL FIXED ENDPOINT

QUALITY CONTROL DATA FROM 02/01/95 TO 22/12/95

Laboratory : Dorset

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	122	20.0	19.8	-0.2	0.2765
B:	122	5.00	4.9	-0.1	0.1864
A+B:	122	25.0	24.8	-0.2	0.3539
A-B:	122	15.0	14.8	-0.2	0.3116

s.d.(AB)      S(between runs): 0.23      Sw:(within run): 0.22      S/Sw: 1.1

On any given day the calibration is accepted if the values obtained lie within the ranges:

24.0   -   26.0   for   A+B  
14.0   -   16.0   for   A-B

## DUPLICATES:

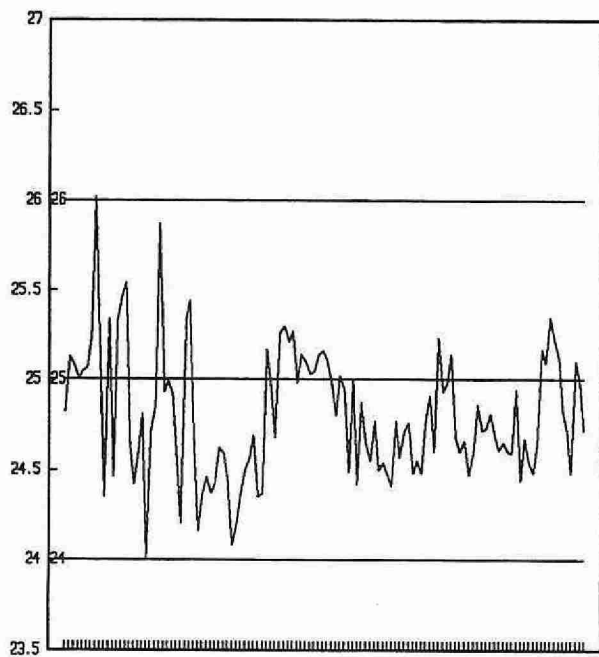
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
235	0.0 - 30.0	0.0525	1.7
3	30.1 - 60.0	0.6283	1.1
25	60.1 - 150	0.5329	0.5
66	151 - 300	0.9808	0.6
329	Overall	0.1553	

## OTHER CHECKS:

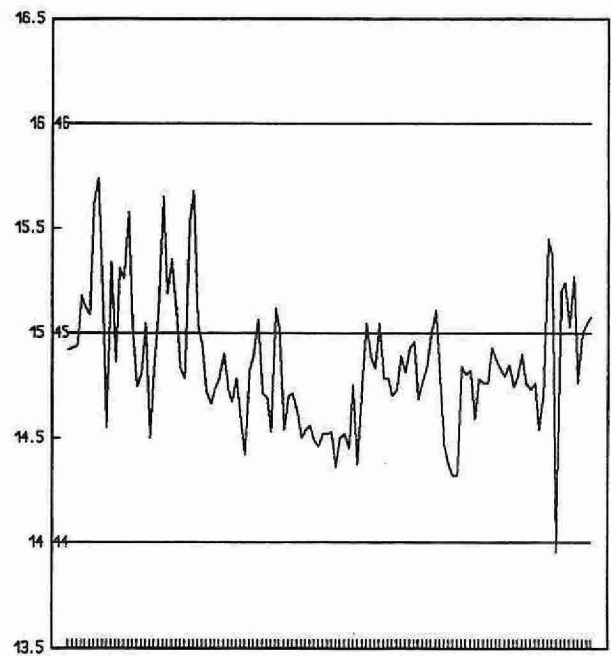
	n	Mean	Standard Deviation (1)
Long Term Blank	122	1.635	0.1018

ALKALINITY, TOTAL FIXED ENDPOINT (mg/L as CaCO<sub>3</sub>)

QUALITY CONTROL DATA FROM 02/01/95 TO 22/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## ALKALINITY, TOTAL FIXED ENDPOINT

### IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	09/07/80
Method Reference No.	E3218A	Units	mg/L as CaCO <sub>3</sub>
LIMS Product Code	PHALK3218	Supervisor	F. Lo
Sample Type/Matrix	Domestic Waters, Sewage, Effluents		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

Samples (10.0 mL) are titrated with 0.02 N sulphuric acid to pH endpoint of 4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant.

pH, and conductivity are determined simultaneously.

### INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

### CONTROLS:

Calibration	BL plus 4 standards, e.g. QCA
Drift	In run standards throughout the run (tap water diluted to 50% V/V)

# ALKALINITY, TOTAL FIXED ENDPOINT

QUALITY CONTROL DATA FROM 05/01/95 TO 29/12/95

Laboratory Unit: Titration

Analytical Range: to 1000 mg/L as  $\text{CaCO}_3$

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	79	250	250.17	0.17	1.1990
B:	79	100	100.36	0.36	0.5253
C:	79	100	99.53	-0.47	0.7067
D:	79	25	24.56	-0.44	0.5357
A+B:	79	350	350.52	0.52	1.4768
A-B:	79	150	149.82	-0.18	1.1057
C+D:	79	125	124.09	-0.91	1.0306
C-D:	79	75	74.97	-0.03	0.7144

s.d.(AB)    S(between runs): 0.93                      Sw(within run): 0.78                      S/Sw: 1.2

s.d.(CD)    S(between runs): 0.63                      Sw(within run): 0.51                      S/Sw: 1.2

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

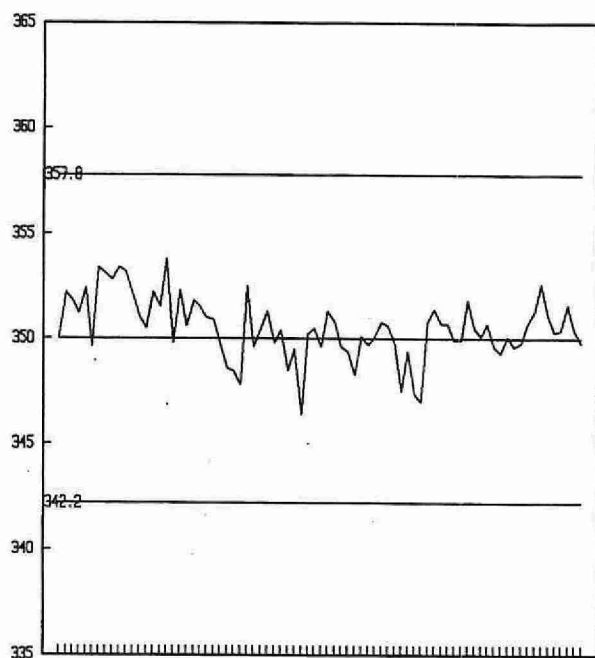
342.20	-	357.80	for	A+B
144.15	-	155.85	for	A-B
119.84	-	130.16	for	C+D
71.13	-	78.87	for	C-D

## DUPLICATES:

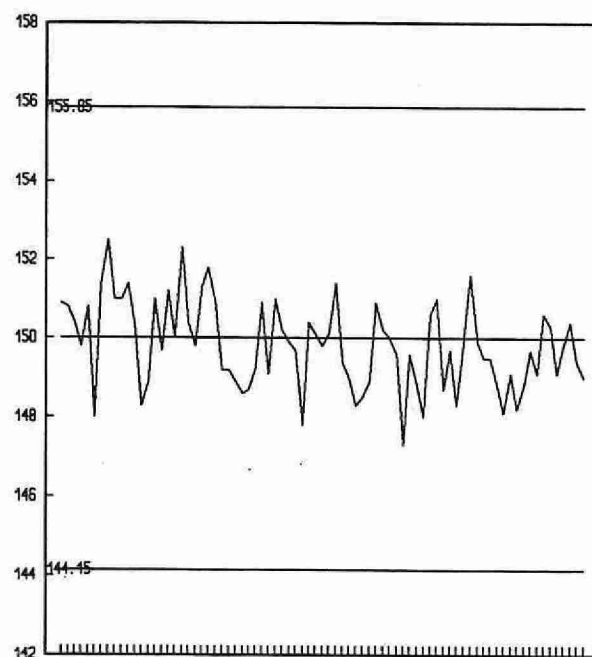
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
91	0 - 100	0.6579	1.7
58	101 - 200	1.0398	0.9
38	201 - 500	1.8719	1.0
2	501 - 1000	N.A.	N.A.
189	Overall	1.0099	

ALKALINITY, TOTAL FIXED ENDPOINT (mg/L as CaCO<sub>3</sub>)

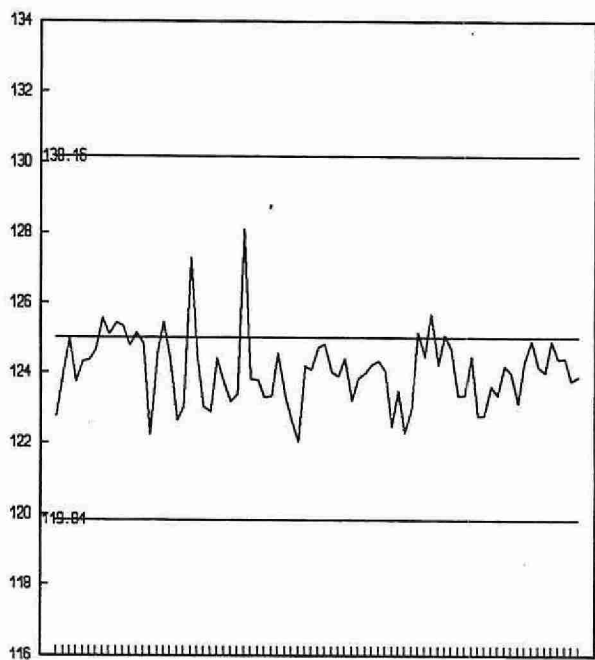
QUALITY CONTROL DATA FROM 05/01/95 TO 29/12/95



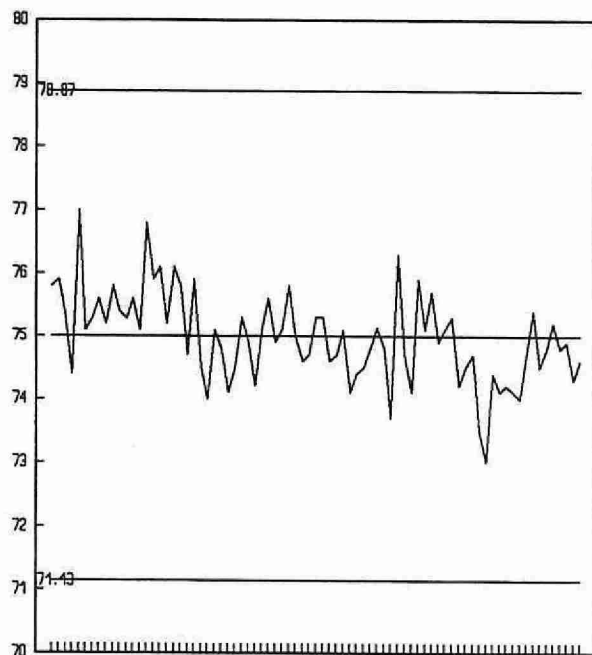
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

CONTROL LIMIT

## ALKALINITY, TOTAL FIXED ENDPOINT

### IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	Before 1980
Method Reference No.	E3228A	Units	mg/L as CaCO <sub>3</sub>
LIMS Product Code	PHALK3228	Supervisor	F. Lo
Sample Type/Matrix	Landfill leachates		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

Samples are pipetted manually (50.0 mL) and titrated with 0.02 N sulphuric acid to pH endpoint of 4.5. Analysis is performed on the supernatant or filtrate.

### INSTRUMENTATION:

Automated modular titration system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
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### CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

### CONTROLS:

Calibration	BL plus 2 standards, e.g. QCA
Drift	In run standards throughout the run (100% tap water)

# ALKALINITY, TOTAL FIXED ENDPOINT

QUALITY CONTROL DATA FROM 10/01/95 TO 21/12/95

Laboratory Unit: Titration

Analytical Range: to 1000 mg/L as CaCO<sub>3</sub>

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	26	570.0	569.5	-0.5	1.6594
B:	26	114.0	116.2	2.2	0.6765
A+B:	26	684.0	685.6	1.6	2.0858
A-B:	26	456.0	453.3	-2.7	1.4395

s.d.(AB)

S(between runs): 1.27

Sw(within run): 1.02

S/Sw: 1.2

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

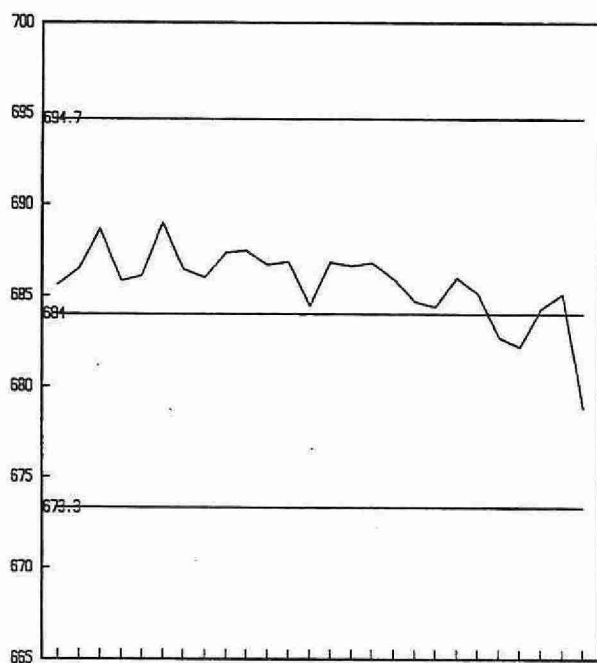
673.3 - 694.7 for A+B  
448 - 464 for A-B

## DUPLICATES:

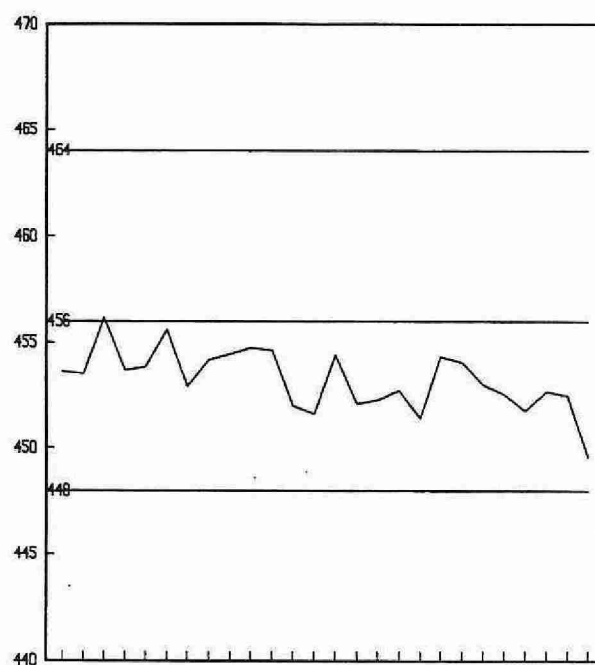
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
46	0 - 200	0.3865	1.4
20	201 - 500	1.2903	0.6
1	501 - 1000	N.A.	N.A.
67	Overall	0.6944	

ALKALINITY, TOTAL FIXED ENDPOINT (mg/L as CaCO<sub>3</sub>)

QUALITY CONTROL DATA FROM 10/01/95 TO 21/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT



## ALKALINITY, TOTAL FIXED ENDPOINT

### IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	09/07/80
Method Reference No.	E3289A	Units	mg/L as CaCO <sub>3</sub>
LIMS Product Code	PHALK3289	Supervisor	F. Lo
Sample Type/Matrix	Rivers, Lakes, Precipitation		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

Samples (10.0 mL) are titrated with 0.02 N sulphuric acid to pH <4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant.

pH and conductivity are determined simultaneously.

### INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

### CONTROLS:

Calibration	BL plus 4 standards, e.g. QCA
Drift	In run standards throughout the run (tap water diluted to 20% V/V)

# ALKALINITY, TOTAL FIXED ENDPOINT

QUALITY CONTROL DATA FROM 03/01/95 TO 27/12/95

Laboratory Unit: Titration

Analytical Range: to 1000 mg/L as CaCO<sub>3</sub>

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	55	250.0	249.67	-0.33	1.343
B:	55	50.0	50.19	0.19	0.351
C:	55	10.0	9.79	-0.21	0.124
D:	55	2.5	2.51	0.01	0.058
A+B:	55	300.0	299.86	-0.14	1.596
A-B:	55	200.0	199.49	-.51	1.143
C+D:	55	12.5	12.29	-0.21	0.153
C-D:	55	7.5	7.28	-0.22	0.119

s.d.(AB)    S(between runs): 0.98                      Sw(within run): 0.81                      S/Sw: 1.2

s.d.(BC)    S(between runs): 0.097                      Sw(within run): 0.084                      S/Sw: 1.1

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

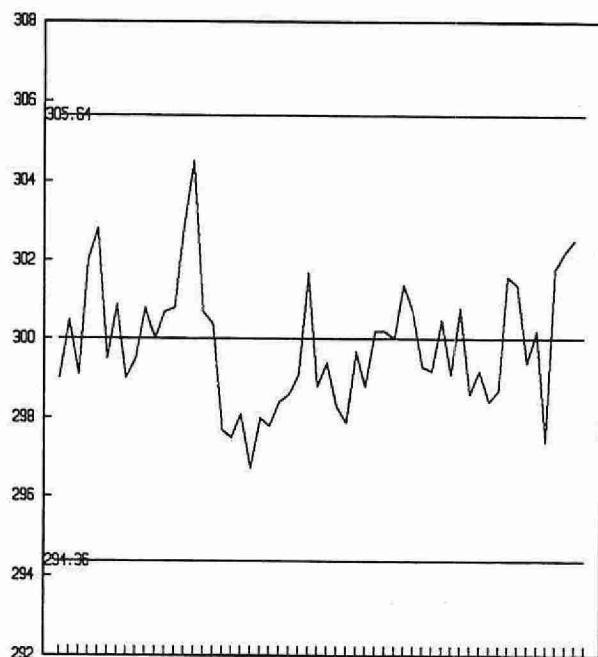
294.36	-	305.64	for	A+B
195.77	-	204.23	for	A-B
11.76	-	13.24	for	C+D
6.95	-	8.05	for	C-D

## DUPLICATES:

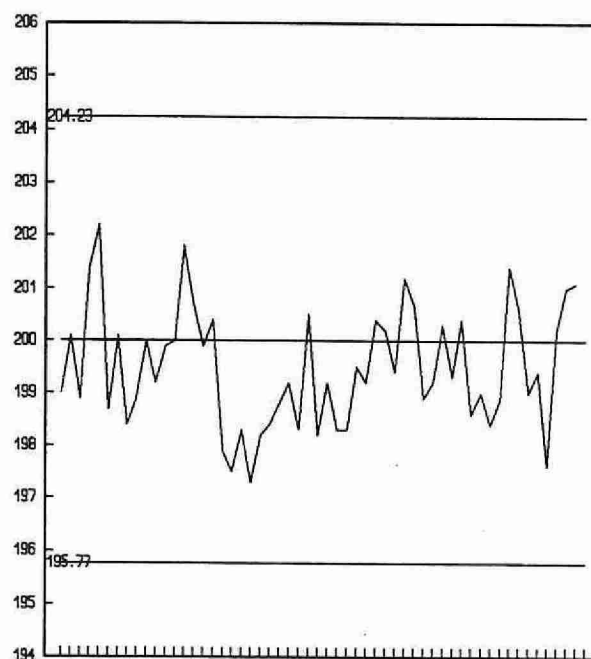
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
20	0 - 50	0.0807	2.4
27	51 - 100	0.5204	0.6
109	101 - 300	1.5434	2.2
1	301 - 1000	N.A.	N.A.
157	Overall	1.2167	

ALKALINITY, TOTAL FIXED ENDPOINT (mg/L as CaCO<sub>3</sub>)

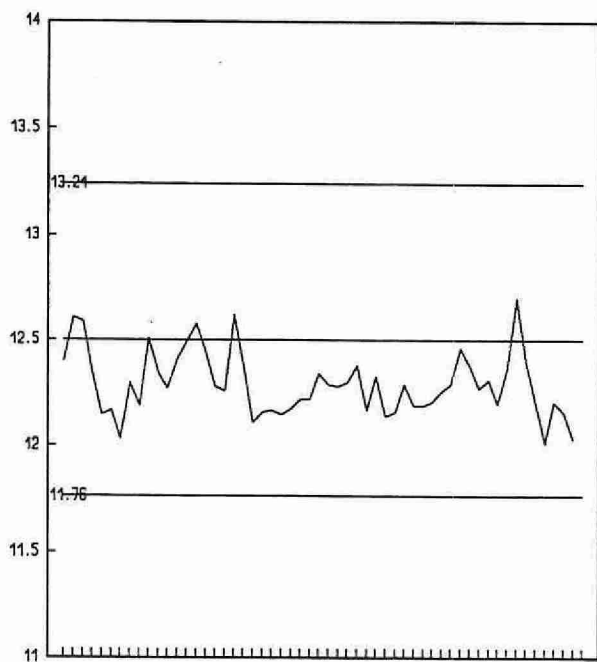
QUALITY CONTROL DATA FROM 03/01/95 TO 27/12/95



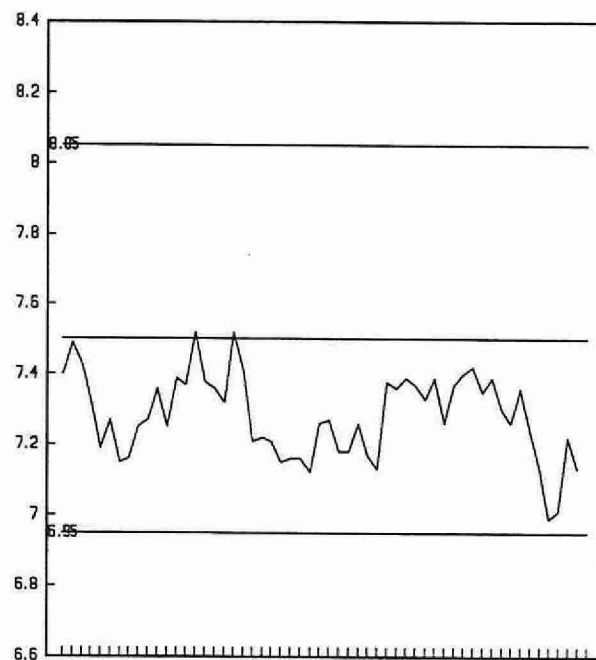
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

CONTROL LIMIT

## ALKALINITY, TOTAL FIXED ENDPOINT (3.8)

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	21/10/85
Method Reference No.	E3042A	Units	mg/L as CaCO <sub>3</sub>
LIMS Product Code	PHALK3042	Supervisor	J. McBride
Sample Type/Matrix	Streams, Lakes, Precipitation, Groundwaters		

### SAMPLING:

Quantity Required	150 mL
Container	Amber polyethylene bottle filled to the brim; screw caps with cone-shaped liners are preferred.

### ANALYTICAL PROCEDURE:

Samples (100 mL) are weighed (volume = weight), and titrated with 0.02 N sulphuric acid to a pH 3.8. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant.

### INSTRUMENTATION:

Semi-automated modular titration system with microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	2 standard buffers - once daily

# ALKALINITY, TOTAL FIXED ENDPOINT (3.8)

QUALITY CONTROL DATA FROM 02/01/95 TO 22/12/95

Laboratory : Dorset

Units: mg/L as CaCO<sub>3</sub>

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	123	20.0	20.06	0.06	0.2667
B:	123	5.00	5.05	0.05	0.2552
A+B:	123	25.0	25.1	0.1	0.4388
A-B:	123	15.0	15.02	0.02	0.2828

s.d.(AB) S(between runs): 0.26

Sw:(within run): 0.20

S/Sw: 1.3

On any given day the calibration is accepted if the values obtained lie within the ranges:

23.28 - 26.72 for A+B  
13.5 - 16.5 for A-B

## DUPLICATES:

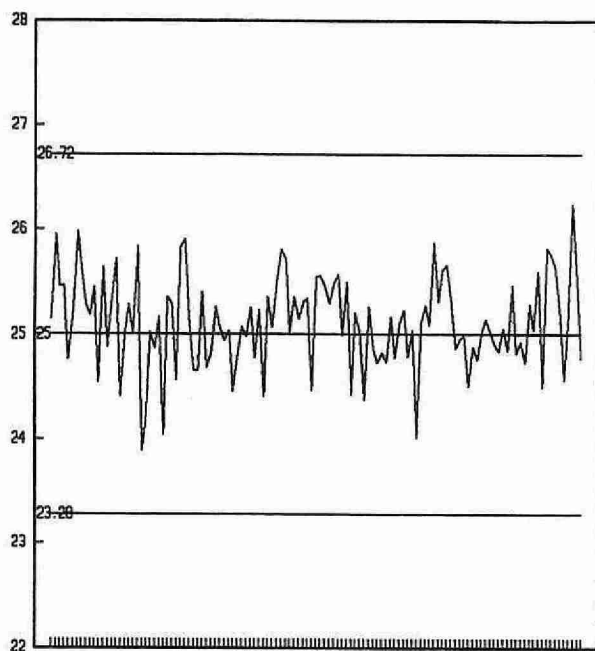
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
274	0.0 - 30.0	0.2595	2.1
1	30.1 - 60.0	N.A.	N.A.
25	60.1 - 150	0.6302	0.5
66	151 - 300	1.1101	0.7
366	Overall	0.3666	

## OTHER CHECKS:

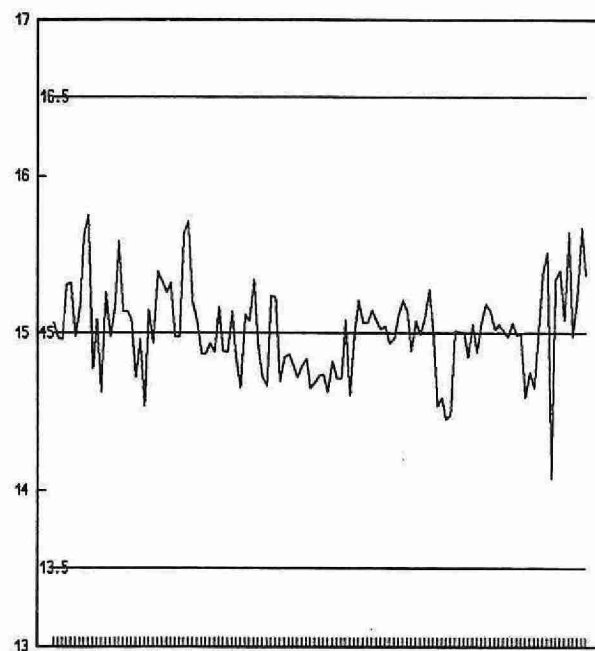
	n	Mean	Standard Deviation (1)
Long Term Blank	123	8.376	0.4510

ALKALINITY, TOTAL FIXED ENDPOINT (3.8)(mg/L as  $\text{CaCO}_3$ )

QUALITY CONTROL DATA FROM 02/01/95 TO 22/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## ALUMINUM, REACTIVE SPECIES

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	24/10/85
Method Reference No.	E3375A	Units	µg/L as Al
LIMS Product Code	ALSP3375A	Supervisor	J. McBride
Sample Type/Matrix	Streams, Lakes, and Soil Leachates		

### SAMPLING:

Quantity Required	30 mL
Container	Plastic or glass

### ANALYTICAL PROCEDURE:

The procedure is based on the formation of an aluminum catechol-violet complex at pH 6.2. Phenanthroline hydroxylamine HCl reagents are used to reduce interference by iron. An ion exchange column is used for separating organic and inorganic aluminum. Concentrations of aluminum are determined by comparison with a similarly prepared series of standards and reported as µg/L as CV reactive Al.

### INSTRUMENTATION:

Automated auto-analyzer/sampler system with colourimeter and chart recorder.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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### CALIBRATION:

BL plus 10 standards daily

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples and BL plus check standard every 20 samples

### NOTES:

Jan. 1995 LIMS replaced LIS and the method reference no. was changed from E3256A to E3375A. LIMS product code is ALSP3375.

**ALUMINUM, REACTIVE SPECIES  
(ALEXCV)**

QUALITY CONTROL DATA FROM 19/01/95 TO 14/09/95

Laboratory: Dorset

Full Scale: to 1000 µg/L as Al

**CALIBRATION CONTROL:**

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	24	600	605	5	5.1323
B:	24	200	202	2	1.7917
C:	24	60	59.9	-0.1	2.3278
A+B:	24	800	807	7	5.9855
A-B:	24	400	403	3	4.9911
B+C:	24	260	262	2	3.2367
B-C:	24	140	142	2	2.6040

s.d.(AB) S(between runs): 3.8

Sw(within run): 3.5

S/Sw: 1.1

s.d.(BC) S(between runs): 2.1

Sw(within run): 1.8

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

775	-	825	for	A+B
390	-	410	for	A-B
252	-	268	for	B+C
134	-	146	for	B-C

**DUPLICATES:**

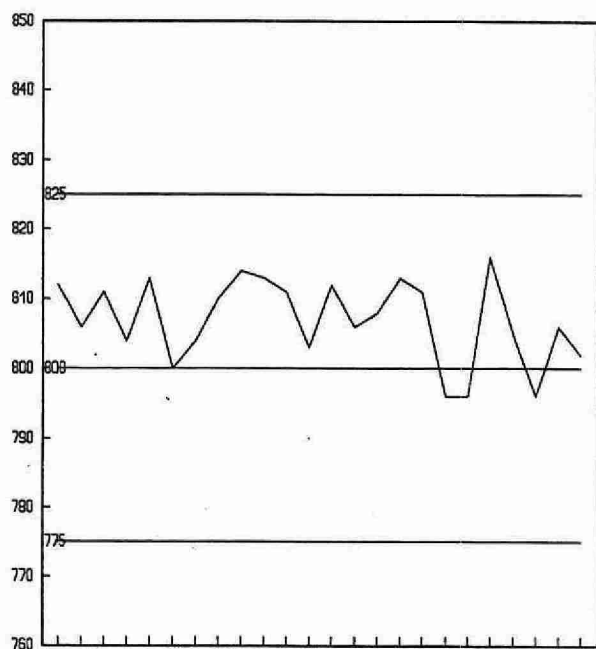
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
55	0.0 - 100	5.0112	10.6
13	101 - 200	9.0600	6.0
3	201 - 500	10.746	4.2
0	501 - 1000	N.A.	N.A.
71	Overall	6.3904	

**OTHER CHECKS:**

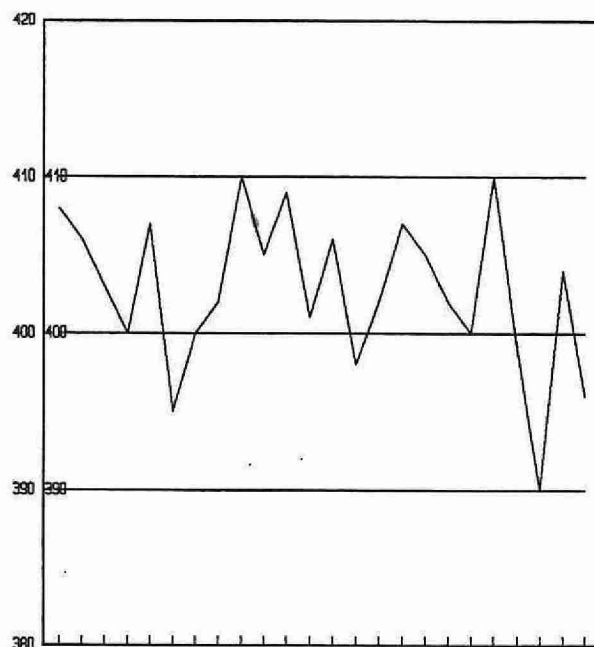
	n	Mean	Standard Deviation (1)
Long Term Blank	24	5	4.644



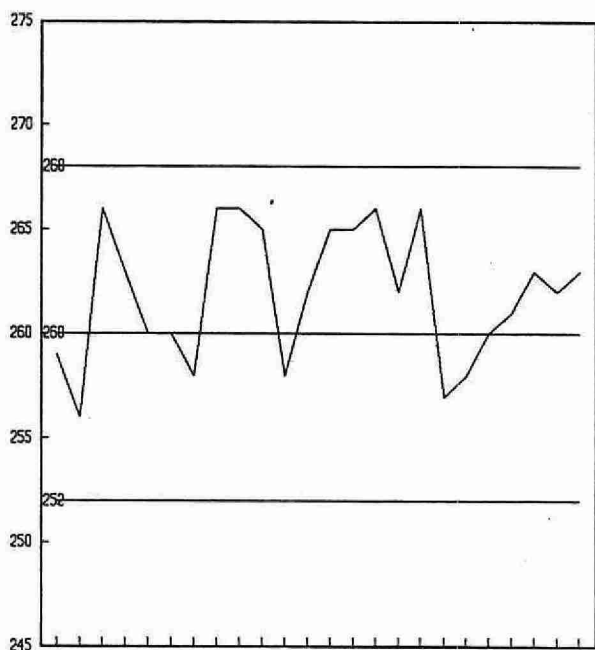
ALUMINUM, REACTIVE SPECIES ( $\mu\text{g/L}$  as AL)  
(ALEXCV)  
QUALITY CONTROL DATA FROM 19/01/95 TO 14/09/95



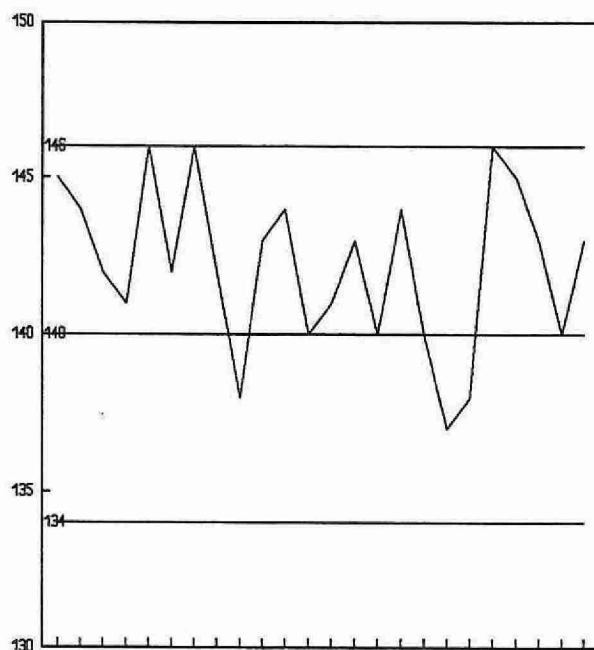
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

**ALUMINUM, REACTIVE SPECIES  
(ALNDCV)**

QUALITY CONTROL DATA FROM 19/01/95 TO 14/09/95

Laboratory: Dorset

Full Scale: to 1000 µg/L as Al

**CALIBRATION CONTROL:**

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	24	600	604	4	5.0503
B:	24	200	201	1	2.3401
C:	24	60	60.8	0.8	2.7659
A+B:	24	800	806	6	6.6914
A-B:	24	400	402	2	4.3305
B+C:	24	260	262	2	4.3205
B-C:	24	140	141	1	2.7816

s.d.(AB) S(between runs): 3.9

Sw(within run): 3.1

S/Sw: 1.3

s.d.(BC) S(between runs): 2.6

Sw(within run): 2.0

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

775	-	825	for	A+B
390	-	410	for	A-B
252	-	268	for	B+C
134	-	146	for	B-C

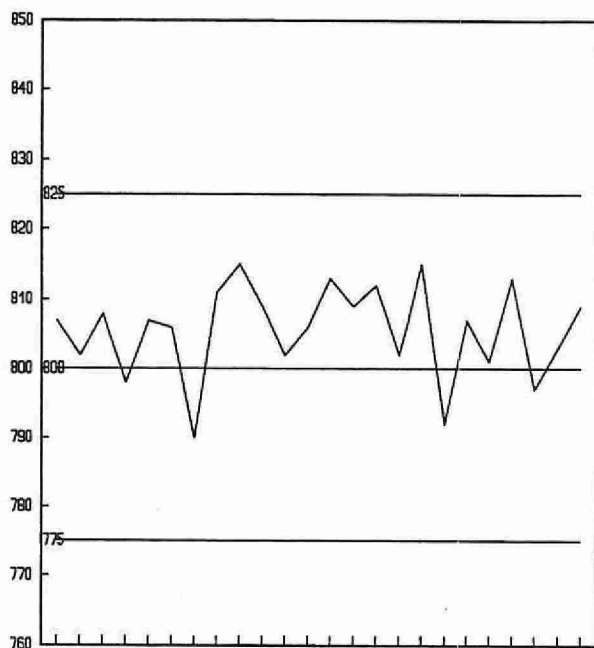
**DUPLICATES:**

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
72	0.0 - 100	3.2959	6.5
30	101 - 200	6.2185	5.3
15	201 - 500	7.3430	1.9
2	501 - 1000	N.A.	N.A.
119	Overall	4.4788	

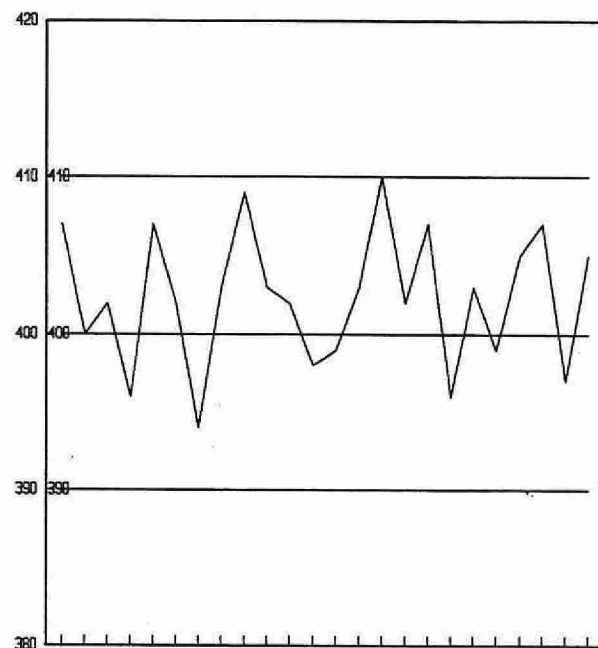
**OTHER CHECKS:**

	n	Mean	Standard Deviation (1)
Long Term Blank	24	4.875	3.7799

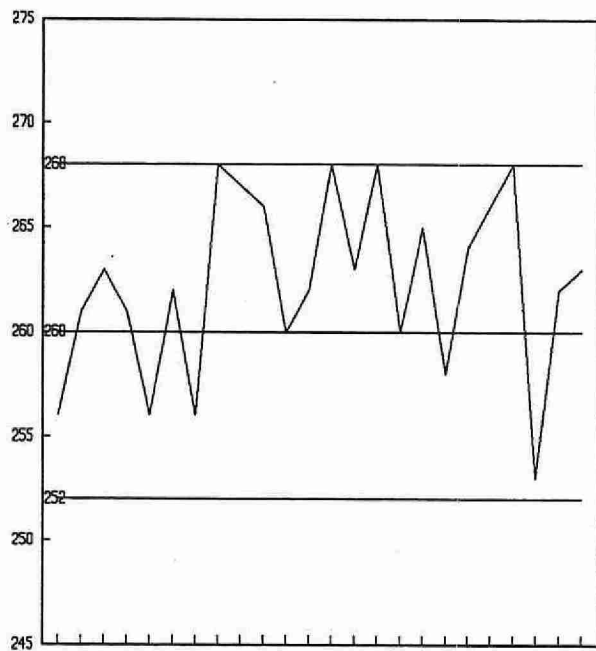
**ALUMINUM, REACTIVE SPECIES ( $\mu\text{g/L}$  as Al)**  
**(ALNDCV)**  
**QUALITY CONTROL DATA FROM 19/01/95 TO 14/09/95**



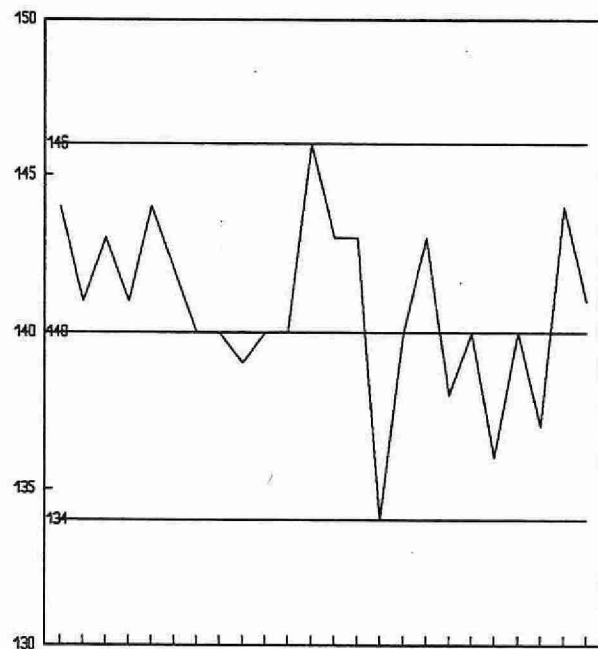
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## ALUMINUM, TOTAL

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	06/09/83
Method Reference No.	E3300A	Units	µg/L as Al
LIMS Product Code	AL3300	Supervisor	J. McBride
Sample Type/Matrix	Streams, Lakes, Precipitation, Biota and Groundwaters		

### SAMPLING:

Quantity Required	10 mL
Container	100 mL Polypropylene bottle capped, acidified to 0.1% with HNO <sub>3</sub>

### ANALYTICAL PROCEDURE:

This procedure is based on the formation of an aluminum-catechol violet complex at pH 6.2. Acidified samples are oxidized by UV digestion for total aluminum. Phenanthroline-hydroxylamine-HCL reagents are used to reduce interference by iron. Concentrations of aluminum are determined by comparison with a similarly prepared series of standards.

### INSTRUMENTATION:

UV-digestor

An autoanalyzer with microprocessor for DCI system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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### CALIBRATION:

BL plus 8 standards daily

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples and BL plus check standard every 20 samples

# ALUMINUM, TOTAL

QUALITY CONTROL DATA FROM 06/01/95 TO 20/12/95

Laboratory: Dorset

Full Scale: to 1000 µg/L as Al

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	54	600	599	-1	3.2477
B:	54	200	201	1	1.9709
C:	54	60	59.5	-0.5	2.5605
A+B:	54	800	801	1	4.7231
A-B:	54	400	398	-2	2.5606
B+C:	54	260	261	1	4.1068
B-C:	54	140	142	2	2.0039

s.d.(AB) S(between runs): 2.68

Sw(within run): 1.81

S/Sw: 1.5

s.d.(BC) S(between runs): 2.28

Sw(within run): 1.42

S/Sw: 1.6

The calibration is accepted if the calibration control values obtained lie within the ranges:

820	-	780	for	A+B
415	-	385	for	A-B
270	-	250	for	B+C
146	-	134	for	B-C

## DUPLICATES:

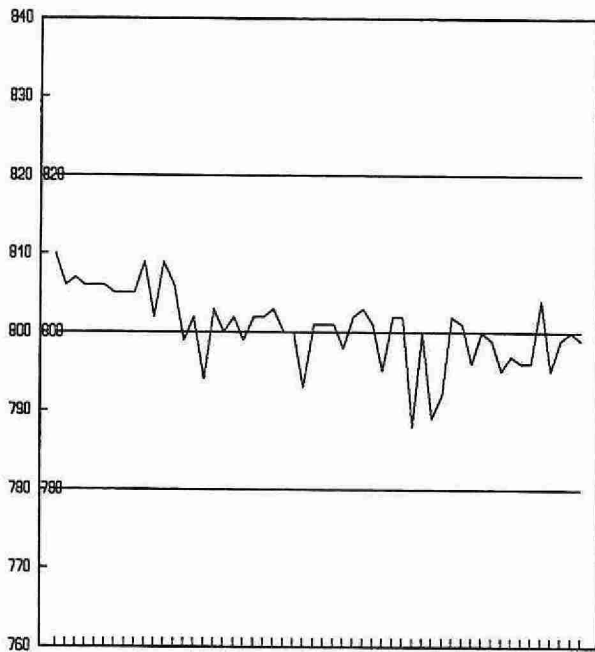
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
75	0.0 - 100	1.2580	4.3
56	101 - 200	1.8660	1.5
24	201 - 500	2.0648	0.6
5	501 - 1000	4.2722	0.5
160	Overall	1.6816	

## OTHER CHECKS:

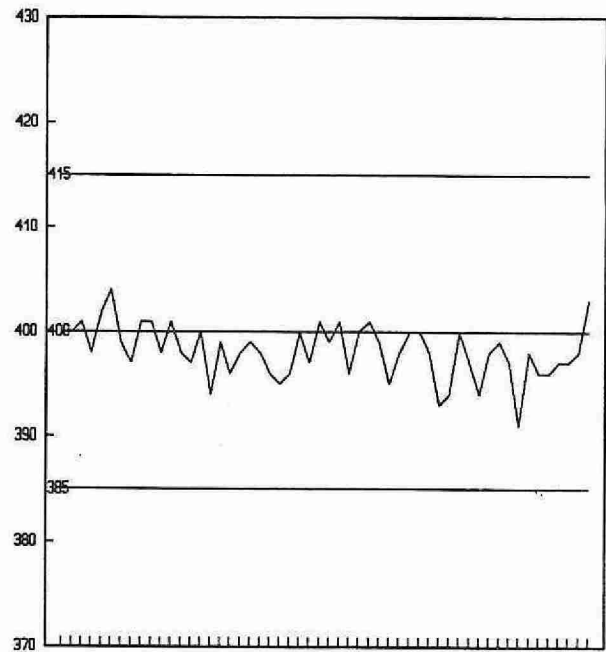
	n	Mean	Standard Deviation (1)
Long Term Blank	54	0.7778	1.0031

ALUMINUM, TOTAL ( $\mu\text{g/L}$  as Al)

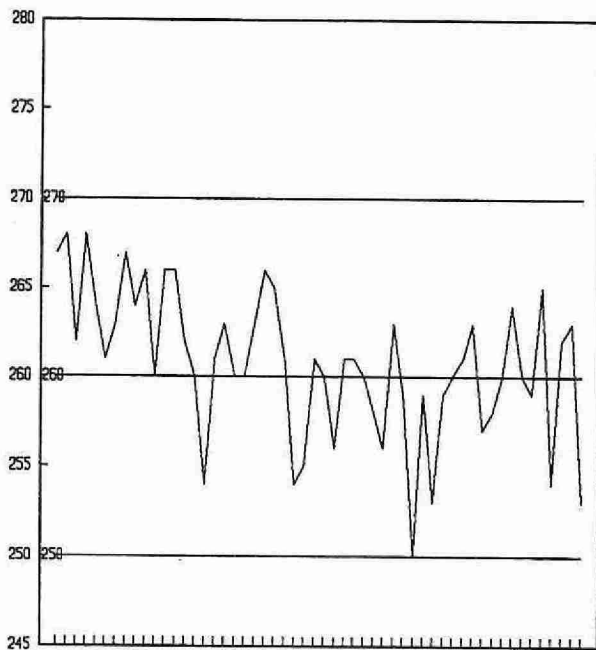
QUALITY CONTROL DATA FROM 06/01/95 TO 20/12/95



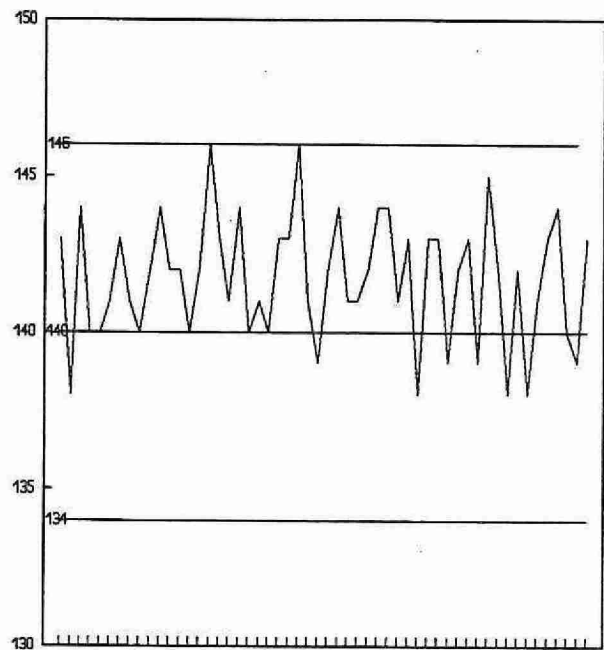
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## CADMIUM, TOTAL

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	26/11/84
Method Reference No.	E3376A	Units	µg/L as Cd
LIMS Product Code	METGF3376	Supervisor	J. McBride
Sample Type/Matrix	Streams, Lakes, Precipitation,		

### SAMPLING:

Quantity Required	5 mL
Container	Glass or plastic, capped, acidified to 0.25% with HNO <sub>3</sub>

### ANALYTICAL PROCEDURE:

Samples are analyzed by GFAAS at 228.8 nm.

Approximate absorbance: 0.400 at the full scale level

### INSTRUMENTATION:

Varian graphite furnace atomic absorption spectrometer with automated sampler.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.001	Current T value: 0.005
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### CALIBRATION:

BL plus 5 standards daily

### CONTROLS:

Calibration	1 NRC sample
Drift	1 blank plus 1 standard

# CADMIUM, TOTAL

QUALITY CONTROL DATA FROM 13/01/95 TO 21/12/95

Laboratory Unit: Dorset

Full Scale: to 5 µg/L as Cd

## CALIBRATION CONTROL:

	n	Mean Concentration	Standard Deviation (1)
NRC	41	0.0298	0.0014

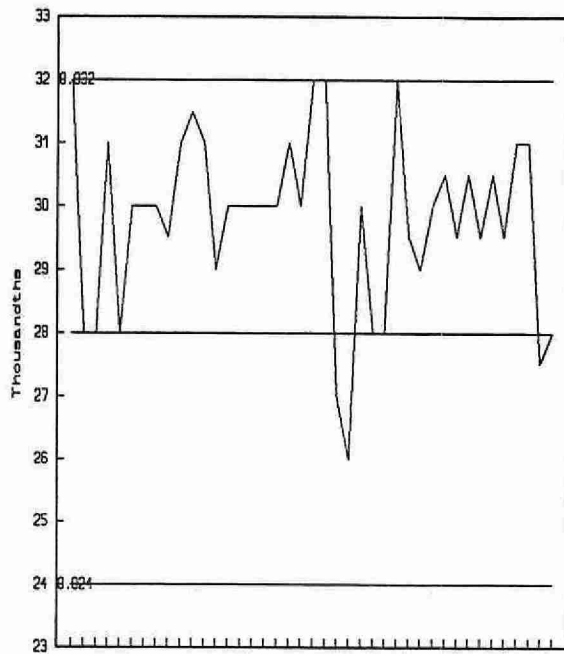
## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
29	0.00 - 0.50	0.0057	18.3
3	0.51 - 1.00	0.0108	1.4
0	1.01 - 2.50	N.A.	N.A.
0	2.51 - 5.00	N.A.	N.A.
32	Overall	0.0070	



CADMIUM, TOTAL ( $\mu\text{g/L}$ )

QUALITY CONTROL DATA FROM 13/01/95 TO 21/12/95



NRC REFERENCE SAMPLE

CONTROL LIMIT

## CALCIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	18/05/79
Method Reference No.	E3146A	Units	mg/L as Ca
LIMS Product Code	CAT3146	Supervisor	J. McBride
Sample Type/Matrix	Precipitation		

### SAMPLING:

Quantity Required	5 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.  
Approximate absorbance: 0.2 at the full scale level.

### INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

# CALCIUM

QUALITY CONTROL DATA FROM 05/01/95 TO 13/10/95

Laboratory Unit: Atomic Absorption

Full Scale: to 2.0 mg/L as Ca

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	22	1.20	1.202	0.002	0.0126
B:	22	0.20	0.2000	0.0000	0.0087
A+B:	22	1.40	1.402	0.002	0.0171
A-B:	22	1.00	1.002	0.002	0.0133

s.d.(AB)

S(between runs): 0.011

Sw(within run): 0.009

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.35 - 1.45 for A+B  
0.96 - 1.04 for A-B

## DUPLICATES:

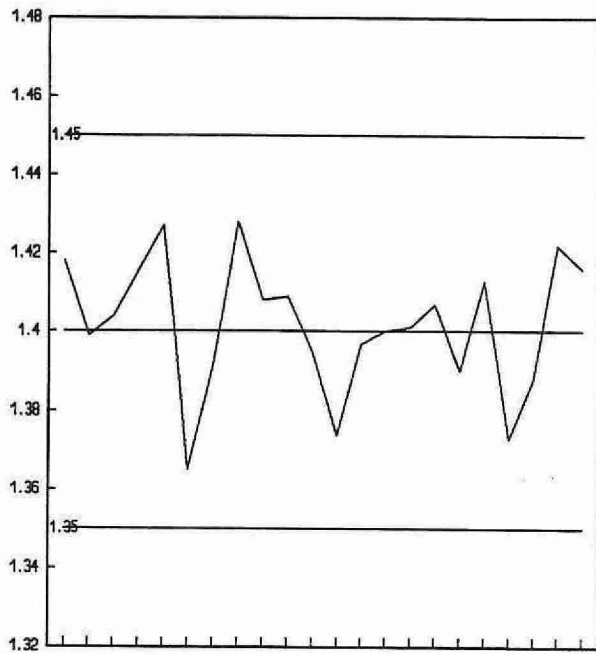
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
17	0.000 - 0.200	0.0064	8.6
11	0.201 - 0.400	0.0054	1.9
7	0.401 - 1.00	0.0109	1.6
10	1.001 - 2.00	0.0103	1.2
45	OVERALL	0.0078	

## OTHER CHECKS:

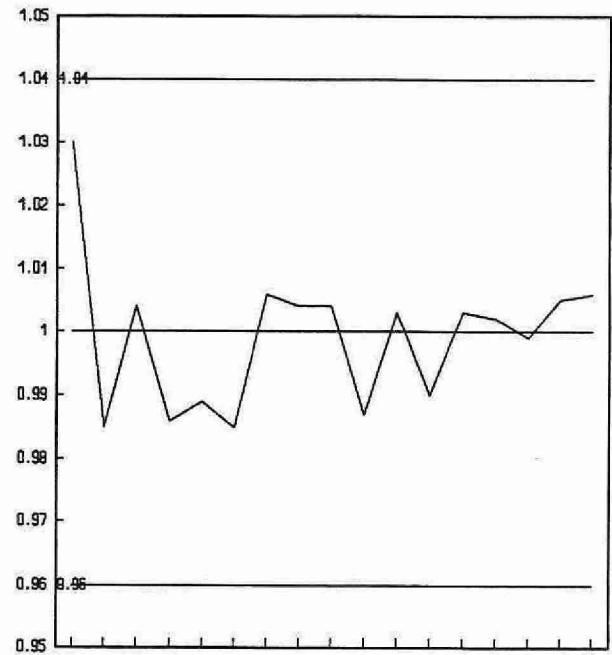
	n	Mean	Standard Deviation (1)
Long Term Blank	22	0.005	0.0132

CALCIUM (mg/L as Ca)

QUALITY CONTROL DATA FROM 05/01/95 TO 13/10/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## CALCIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	01/04/74
Method Reference No.	E3171A	Units	mg/L as Ca
LIMS Product Code	CAT3171,CA3171,HARD3171	Supervisor	J. McBride
Sample Type/Matrix	Surface Waters, DWSP Drinking Waters		

### SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 1.14 at the full scale level.

### INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

BL plus 11 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

### NOTES:

Control Limits were exceeded on July 15 and August 9, 1994.

# CALCIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/95

Laboratory Unit: Atomic Absorption

Full Scale: to 40.0 mg/L as Ca

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	126	32.0	32.1	0.1	0.3119
B:	126	8.00	8.06	0.06	0.1042
C:	126	2.00	2.00	0.0	0.0384
A+B:	126	40.0	40.2	0.2	0.3574
A-B:	126	24.0	24.1	0.1	0.2974
B+C:	126	10.0	10.1	0.1	0.1228
B-C:	126	6.00	6.06	0.06	0.0978

s.d.(AB) S(between runs): 0.23

Sw(within run): 0.21

S/Sw: 1.1

s.d.(BC) S(between runs): 0.08

Sw(within run): 0.07

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

38.8	-	41.2	for	A+B
23.1	-	24.9	for	A-B
9.60	-	10.4	for	B+C
5.70	-	6.30	for	B-C

## DUPLICATES:

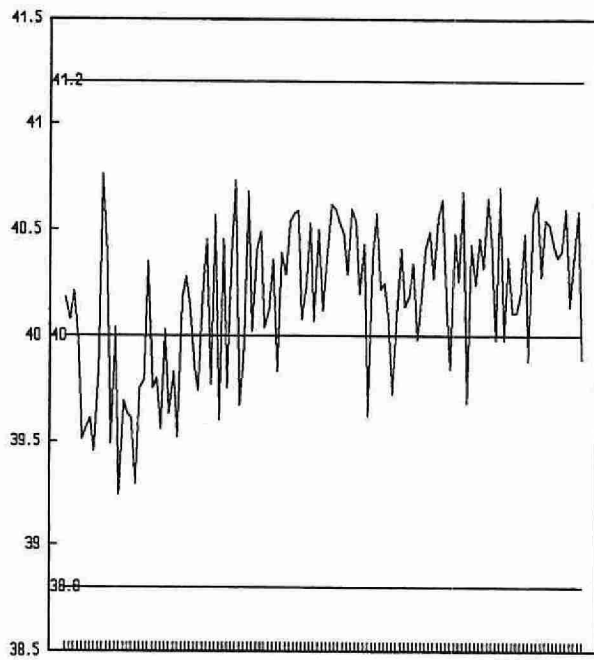
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
35	0.00 - 4.00	0.0403	2.9
32	4.01 - 8.00	0.0917	1.6
127	8.01 - 20.0	0.1876	1.8
94	20.1 - 40.0	0.3753	1.1
288	Overall	0.2044	

## OTHER CHECKS:

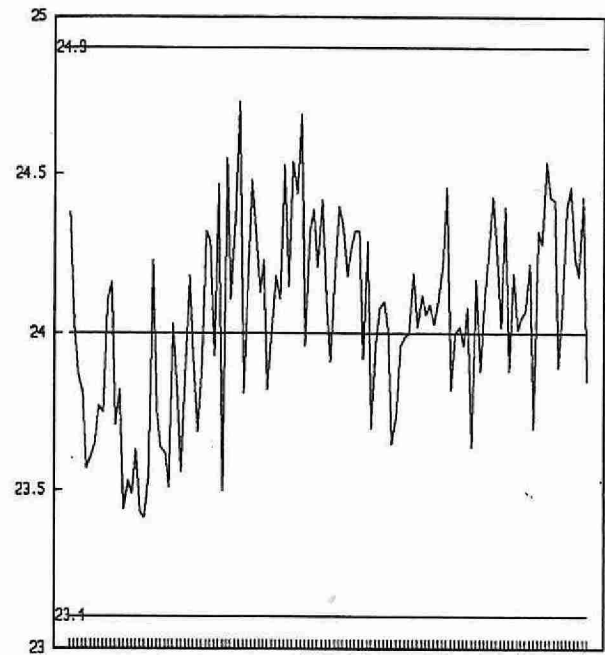
	n	Mean	Standard Deviation (1)
Long Term Blank	126	0.0032	0.0271

CALCIUM (mg/L as Ca)

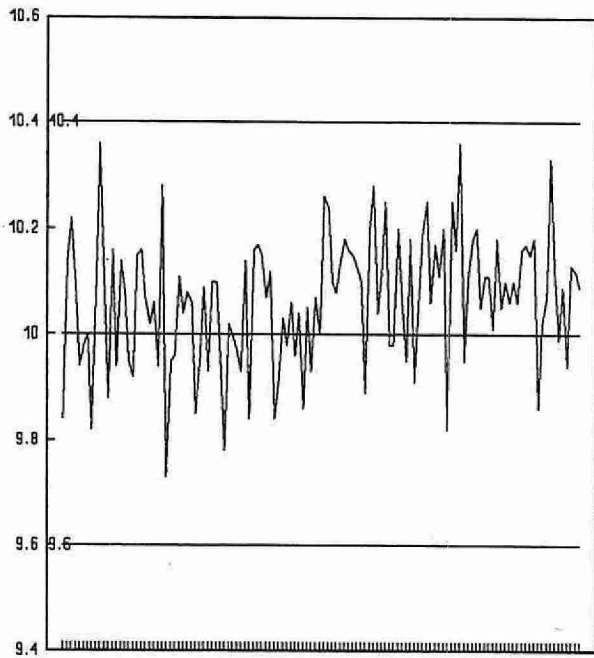
QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/95



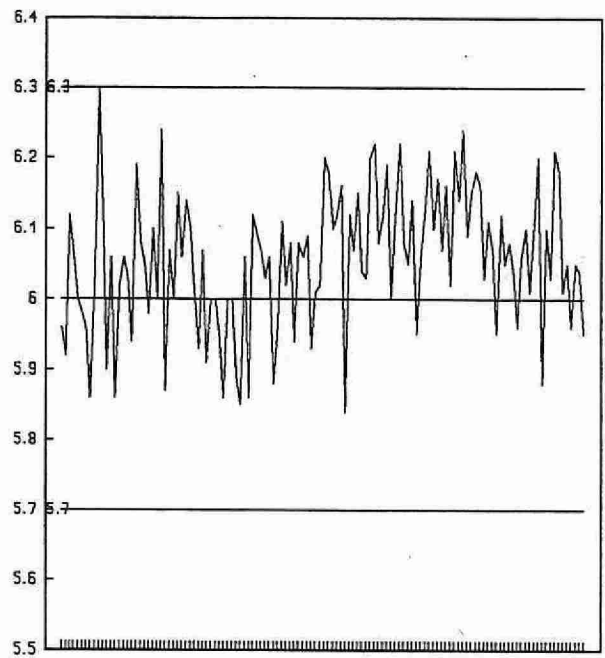
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## CALCIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	08/04/86
Method Reference No.	E3217A	Units	mg/L as Ca
LIMS Product Code	CAT3217,CATS3217,HARD3217	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents, Sewage, Industrial Wastes		

### SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 1.17 at the full scale level.

### INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1.0
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### CALIBRATION:

BL plus 11 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.



# CALCIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 28/12/95

Laboratory Unit: Absorption

Full Scale: to 200.0 mg/L as Ca

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	175	160.0	159.52	-0.48	2.6487
B:	175	40.0	40.27	0.27	1.1867
C:	175	10.0	10.16	0.16	0.3841
A+B:	175	200.0	199.70	-0.30	3.4133
A-B:	175	120.0	119.21	-0.79	2.3375
B+C:	175	50.0	50.40	0.40	1.4684
B-C:	175	30.0	30.11	0.11	0.8782

s.d.(AB) S(between runs): 2.05

Sw(within run): 1.66

S/Sw: 1.2

s.d.(BC) S(between runs): 0.88

Sw(within run): 0.62

S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

190	-	210	for	A+B
113	-	127	for	A-B
44.5	-	54.5	for	B+C
27.0	-	33.0	for	B-C

## DUPLICATES:

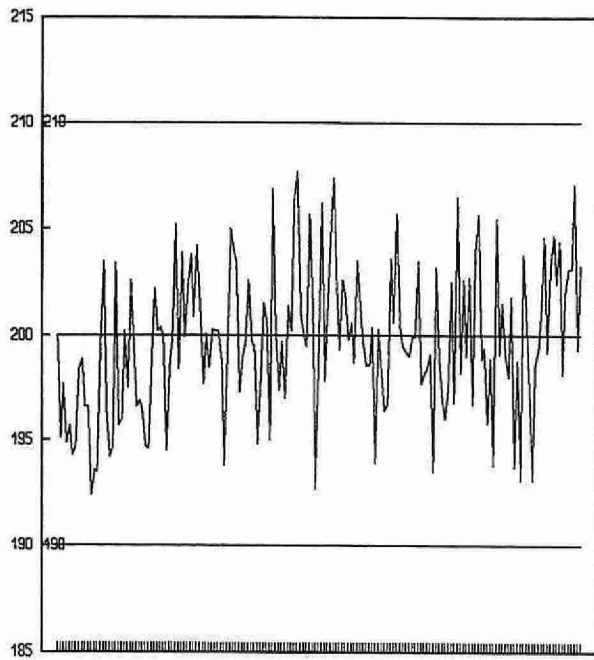
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
97	0.00 - 20.00	0.4010	4.5
121	20.01 - 40.00	0.9438	2.7
174	40.01 - 100.00	1.3605	2.0
91	100.01 - 200.00	2.3431	1.5
483	Overall	1.2140	

## OTHER CHECKS:

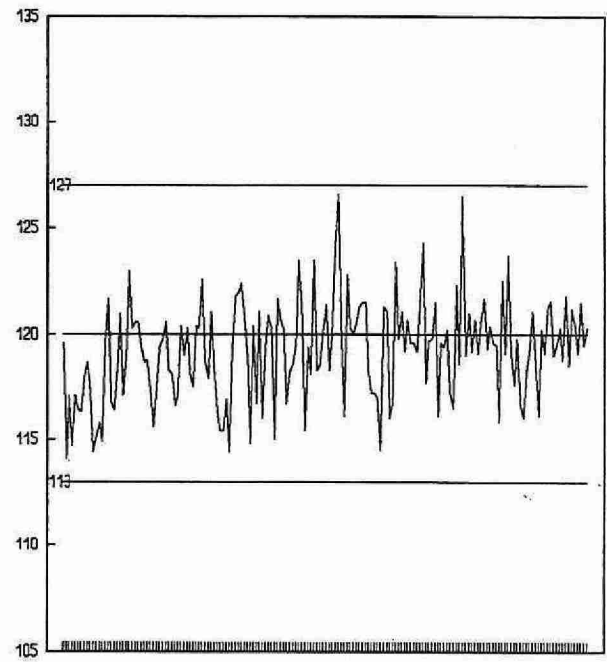
	n	Mean	Standard Deviation (1)
Long Term Blank	173	-0.0614	0.1477

CALCIUM (mg/L as Ca)

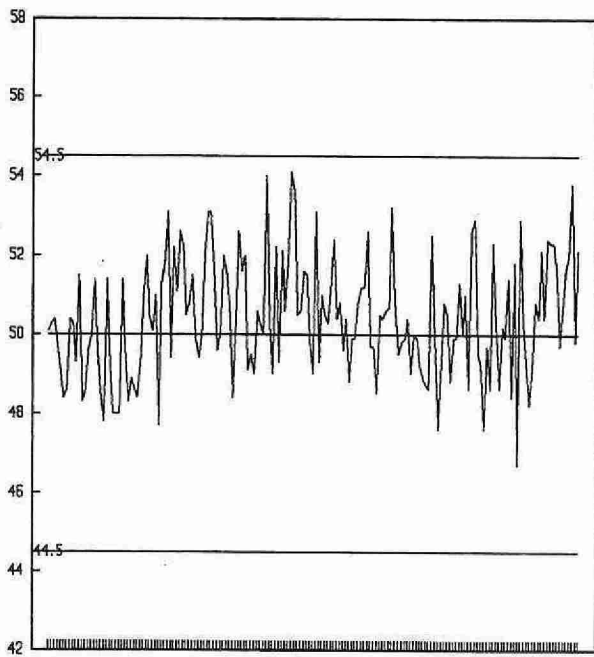
QUALITY CONTROL DATA FROM 03/01/95 TO 28/12/95



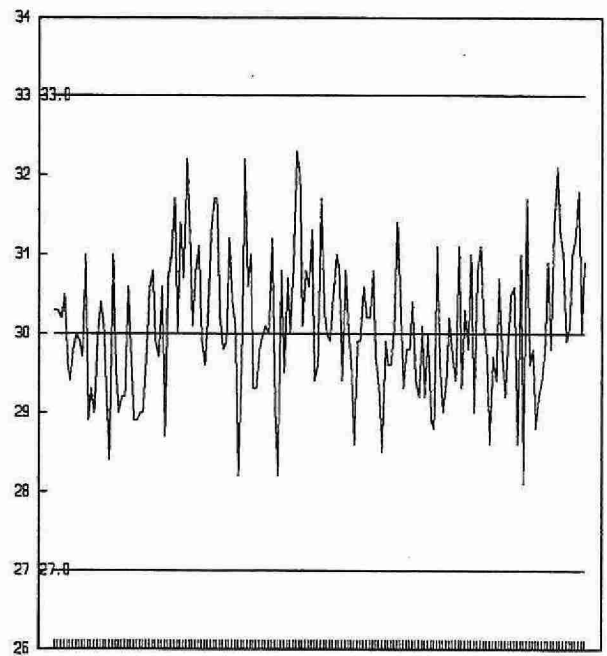
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## CALCIUM

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Units	mg/L as Ca
LIMS Product Code	CAT3249	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes,		

### SAMPLING:

Quantity Required	5 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 422.7 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.2 at the full scale level.

### INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
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### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

### NOTES:

The control standards are corrected for the LTB from which they were made.

# CALCIUM

QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/95

Laboratory Unit: Dorset

Full Scale: to 8.0 mg/L as Ca

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	58	6.4	6.421	0.021	0.0438
B:	58	1.6	1.613	0.013	0.0140
C:	58	0.4	0.410	0.010	0.0093
A+B:	58	8.0	8.022	0.022	0.0470
A-B:	58	4.8	4.808	0.008	0.0461
B+C:	58	2.0	2.011	0.011	0.0181
B-C:	58	1.2	1.203	0.003	0.0178

s.d.(AB) S(between runs): 0.03 Sw(within run): 0.03 S/Sw: 1.0  
s.d.(BC) S(between runs): 0.011 Sw(within run): 0.012 S/Sw: 0.9

The calibration is accepted if the calibration control values obtained lie within the ranges:

7.85 - 8.15 for A+B  
4.69 - 4.91 for A-B  
1.95 - 2.05 for B+C  
1.16 - 1.24 for B-C

## DUPLICATES:

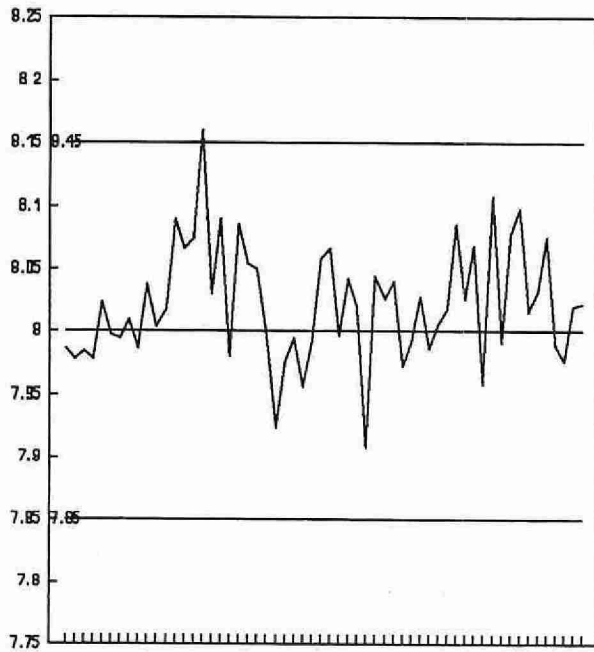
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
23	0.00 - 0.80	0.0073	3.5
17	0.81 - 1.60	0.0241	2.8
102	1.61 - 4.00	0.0510	3.4
12	4.01 - 8.00	0.0707	1.2
154	Overall	0.0436	

## OTHER CHECKS:

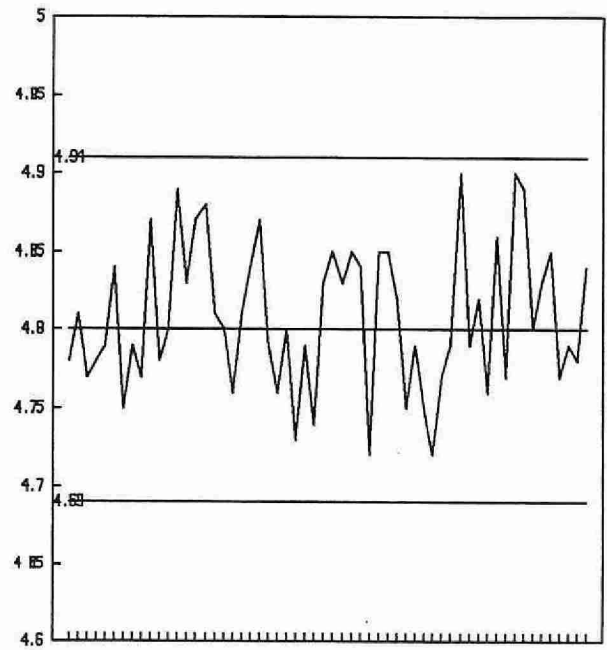
	n	Mean	Standard Deviation (1)
Long Term Blank	58	0.006	0.0072

CALCIUM (mg/L as Ca)

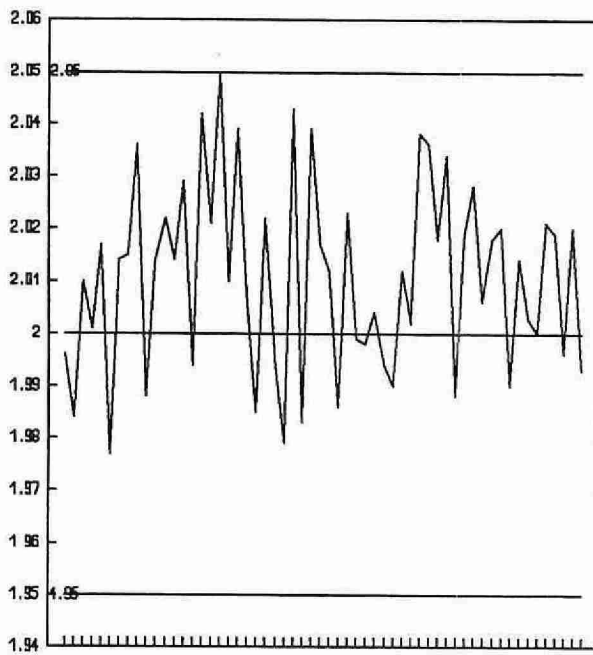
QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/95



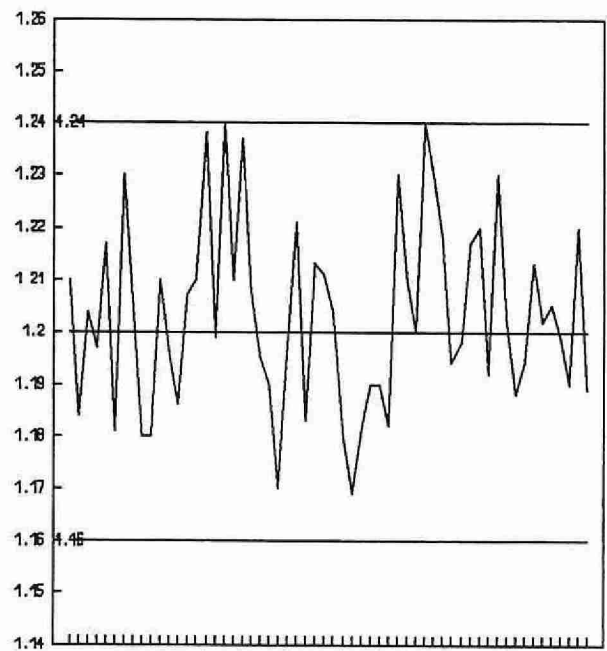
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## CARBON, DISSOLVED INORGANIC

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	03/06/80
Method Reference No.	E3028A	Units	mg/L as C
LIMS Product Code	CARB3028	Supervisor	J. McBride
Sample Type/Matrix	Streams, Lakes, Groundwater and Soil Leachates		

### SAMPLING:

Quantity Required	50 mL
Container	Glass

### ANALYTICAL PROCEDURE:

Dissolved inorganic carbon, which is determined colourimetrically on the supernatant of a settled sample, is converted to carbon dioxide gas by acidification. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved inorganic carbon content of the sample.

Approximate absorbance: 0.3 at the full scale level.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: air (CO<sub>2</sub>-free) supply, dialysis unit. Colourimetric measurement is through a 5.0 cm. light path at 550 nm. Two analytical ranges are obtained from the output of the colourimeter.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
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### CALIBRATION:

BL plus 9 standards daily

### CONTROLS:

Calibration	LTB plus 3 standards, e.g. QCA, QCB, QCC
Drift	BL every 10 samples; BL plus 1 check standard every 20 samples

# CARBON, DISSOLVED INORGANIC

QUALITY CONTROL DATA FROM 05/01/95 TO 20/12/95

Laboratory : Dorset

Full Scale: to 10.0 mg/L as C

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	57	8.0	7.91	-0.09	0.1764
B:	57	4.0	3.93	-0.07	0.0978
C:	57	0.8	0.71	-0.09	0.0444
A+B:	57	12.0	11.84	-0.16	0.2464
A-B:	57	4.0	3.99	-0.01	0.1439
B+C:	57	4.8	4.64	-0.16	0.1270
B-C:	57	3.2	3.22	0.02	0.0834

s.d.(AB) S(between runs): 0.14

Sw(within run): 0.10

S/Sw: 1.4

s.d.(BC) S(between runs): 0.08

Sw(within run): 0.06

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

11.4	-	12.6	for	A+B
3.6	-	4.4	for	A-B
4.4	-	5.2	for	B+C
2.9	-	3.5	for	B-C

## DUPLICATES:

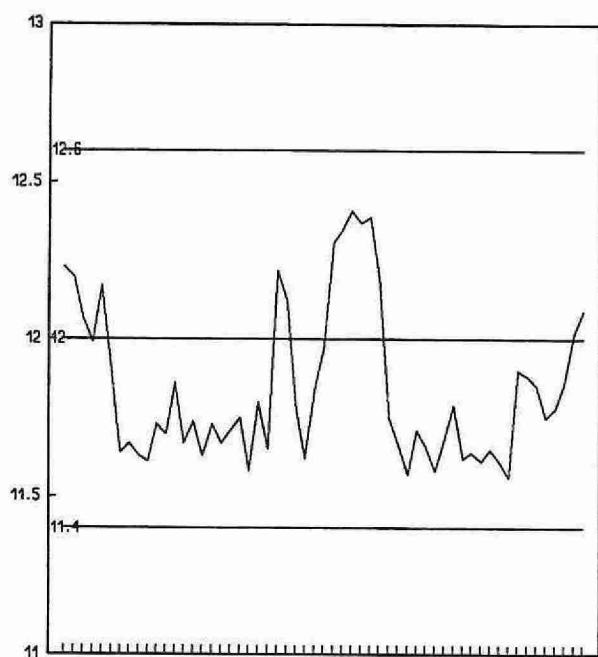
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
42	0.00 - 1.00	0.0162	2.4
50	1.01 - 2.00	0.0334	2.0
69	2.01 - 5.00	0.0795	3.1
6	5.01 - 10.0	0.0871	1.2
167	Overall	0.0430	

## OTHER CHECKS:

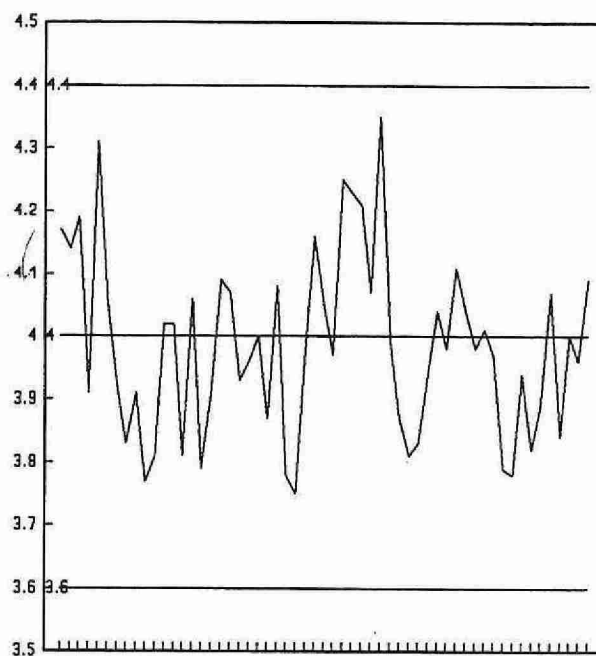
	n	Mean	Standard Deviation (1)
Long Term Blank	57	0.2149	0.0481

CARBON, DISSOLVED INORGANIC (mg/L as C)

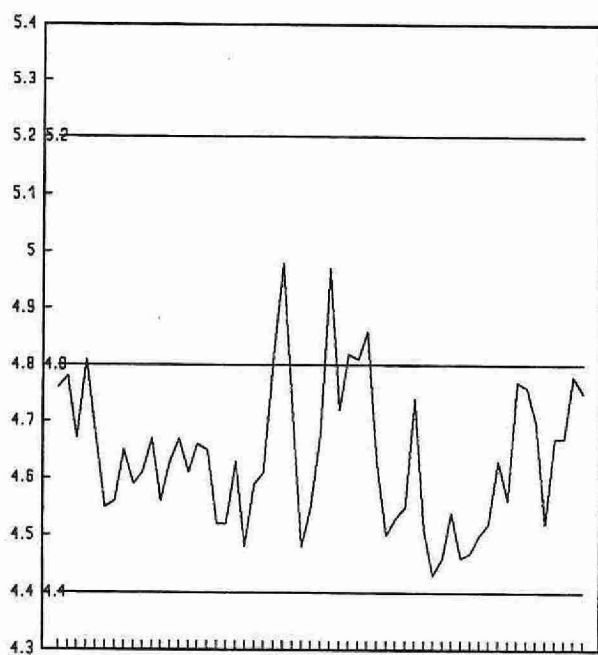
QUALITY CONTROL DATA FROM 05/01/95 TO 20/12/95



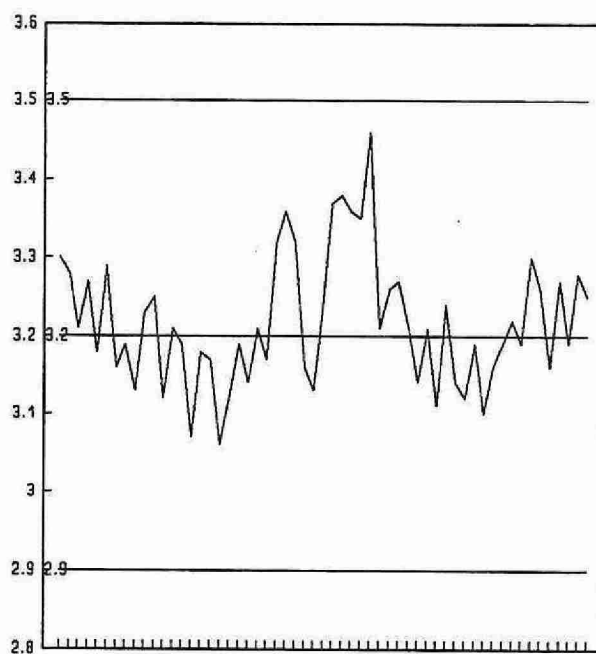
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT



## CARBON, DISSOLVED INORGANIC

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No.	E3370A	Units	mg/L as C
LIMS Product Code	DCSI3370	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents, Domestic Water Supplies, Leachates, Sewages, Industrial Wastes		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Dissolved inorganic carbon, which is determined colourimetrically on the supernatant of a settled sample, is converted to carbon dioxide gas by acidification. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved inorganic carbon content of the sample.

Approximate absorbance: 0.3 at the full scale level.

Dissolved organic carbon, and reactive silicates are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: air (CO<sub>2</sub>-free) supply, dialysis unit. Colourimetric measurement is through a 5.0 cm. light path at 550 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1.0
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; standard every 20 samples.

### NOTES:

Sept.'94 the method codes ROM-E3176A, and E3178A were amalgamated and a new method code ROM-E3370A was generated.

Nov'94 the full scale range was changed to 80 mg/L as C.

# CARBON, DISSOLVED INORGANIC

QUALITY CONTROL DATA FROM 04/01/95 TO 21/12/95

Laboratory Unit: Colourimetry

Full Scale: to 80.0 mg/L as C

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	168	64.0	64.2	0.2	0.4043
B:	168	16.0	15.9	-0.1	0.2728
C:	168	4.00	4.06	0.06	0.2003
A+B:	168	80.0	80.2	0.2	0.5016
A-B:	168	48.0	48.3	0.3	0.4734
B+C:	168	20.0	19.996	-0.004	0.3800
B-C:	168	12.0	11.9	-0.1	0.2909

s.d.(AB) S(between runs): 0.34

Sw(within run): 0.33

S/Sw: 1.0

s.d.(BC) S(between runs): 0.24

Sw(within run): 0.21

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

78.06	-	81.94	for	A+B
46.55	-	49.45	for	A-B
19.11	-	20.86	for	B+C
11.35	-	12.65	for	B-C

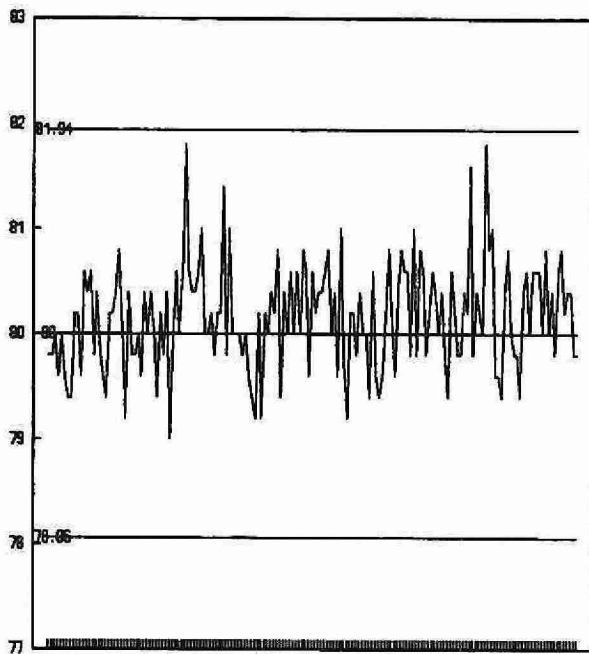
## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
157	0.00 - 8.00	0.2692	20.3
27	8.01 - 16.0	0.2850	4.1
174	16.1 - 40.0	0.3016	1.6
124	40.1 - 80.0	0.6133	1.5
482	Overall	0.3536	

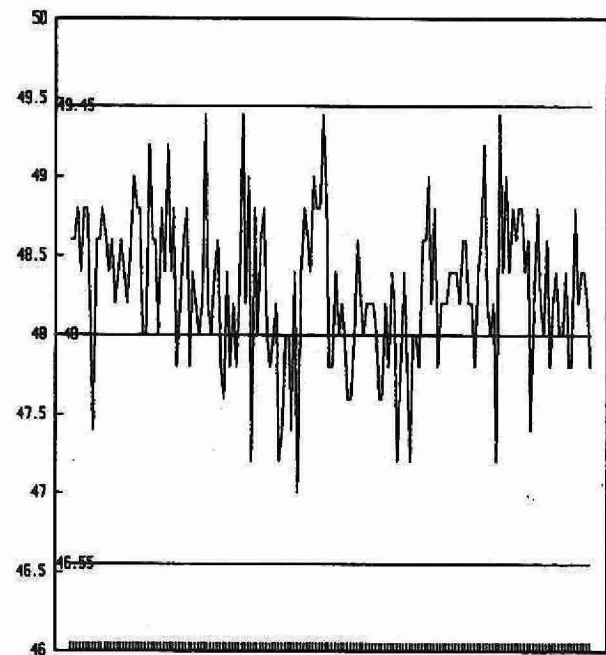
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	168	-0.0214	0.2111

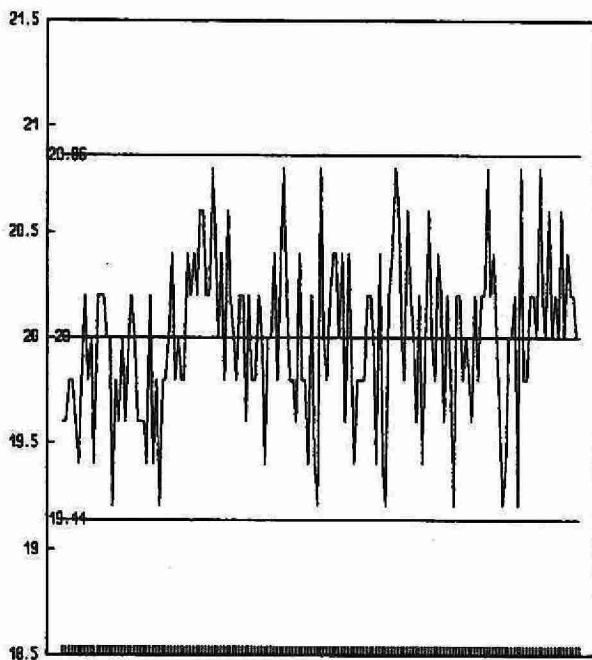
CARBON, DISSOLVED INORGANIC (mg/L as C)  
QUALITY CONTROL DATA FROM 04/01/95 TO 21/12/95



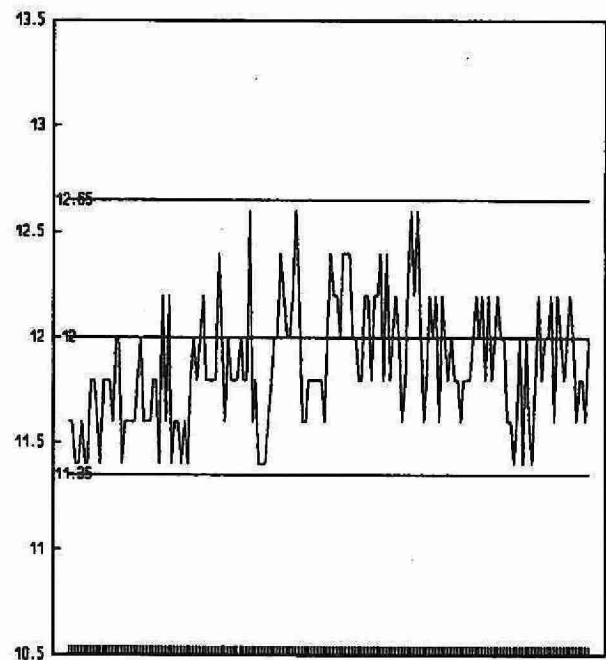
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## CARBON, DISSOLVED ORGANIC

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No.	E3370A	Units	mg/L as C
LIMS Product Code	DCSI3370	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents, Domestic Water Supplies, Leachates, Sewages, Industrial Wastes		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Using an automated system, the supernatant from a settled sample is acidified and flushed with nitrogen gas to remove inorganic carbon. Organic carbon is then oxidized to carbon dioxide gas by exposure to ultra-violet light (UV) in acid-persulphate media. The gas then passes through a gas-permeable membrane into a weakly-buffered alkaline phenolphthalein solution. The decrease in absorbance of this coloured solution is a measure of the dissolved organic carbon content of the sample.

Approximate absorbance: 0.3 at the full scale level.

Dissolved inorganic carbon, and reactive silicates are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: nitrogen and air (CO<sub>2</sub>-free) supplies with flow controls, dialysis unit, UV digester. Colourimetric measurement is through a 5.0 cm. light path at 550 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.1	Current T value: 0.5
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

### NOTES:

Sept.'94 the method codes ROM-E3176A, and E3178A were amalgamated and a new method code ROM-E3370A was generated.

# CARBON, DISSOLVED ORGANIC

QUALITY CONTROL DATA FROM 04/01/95 TO 21/12/95

Laboratory Unit: Colourimetry

Full Scale: to 20.0 mg/L as C

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	168	16.0	16.001	0.001	0.1520
B:	168	4.00	3.96	-0.04	0.0890
C:	168	1.00	1.02	0.02	0.0722
A+B:	168	20.0	19.97	-0.03	0.1876
A-B:	168	12.0	12.04	0.04	0.1639
B+C:	168	5.00	4.99	-0.01	0.1272
B-C:	168	3.00	2.94	-0.06	0.1004

s.d.(AB) S(between runs): 0.125

Sw(within run): 0.116

S/Sw: 1.1

s.d.(BC) S(between runs): 0.081

Sw(within run): 0.071

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

19.44	-	20.56	for	A+B
11.58	-	12.42	for	A-B
4.72	-	5.28	for	B+C
2.79	-	3.21	for	B-C

## DUPLICATES:

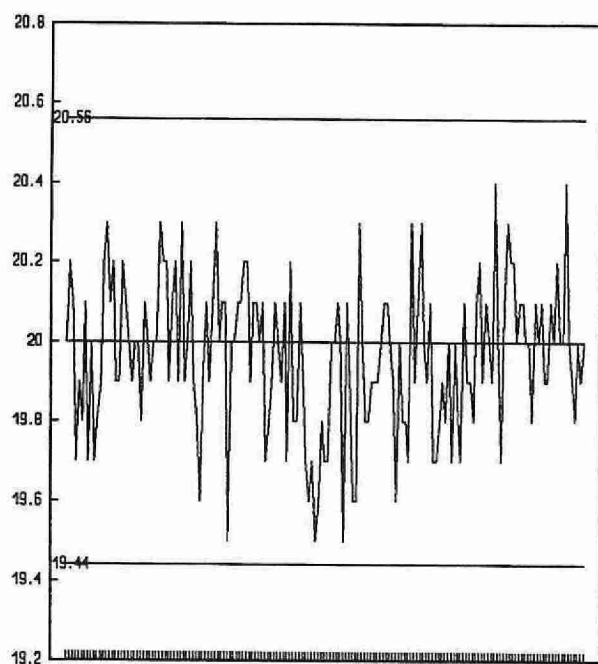
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
191	0.00 - 2.00	0.0955	10.0
136	2.01 - 4.00	0.1253	7.0
142	4.01 - 10.0	0.1567	2.7
21	10.1 - 20.0	0.2896	1.8
490	Overall	0.1266	

## OTHER CHECKS:

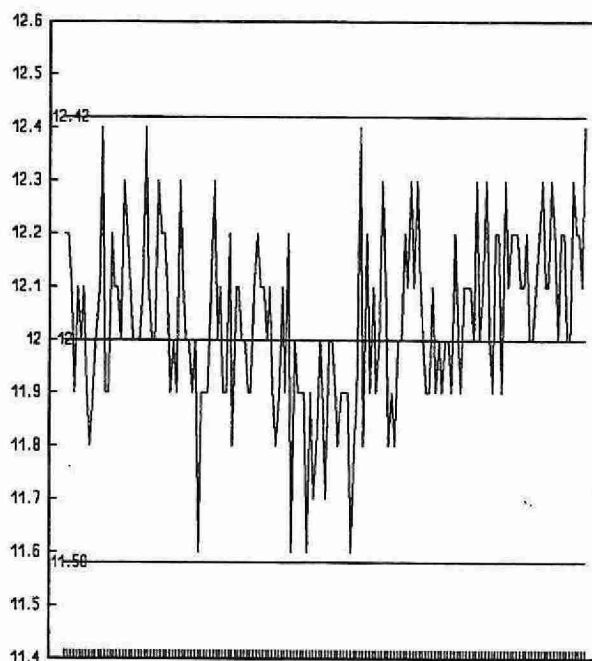
	n	Mean	Standard Deviation (1)
Long Term Blank	168	0.0286	0.1159

# CARBON, DISSOLVED ORGANIC (mg/L as C)

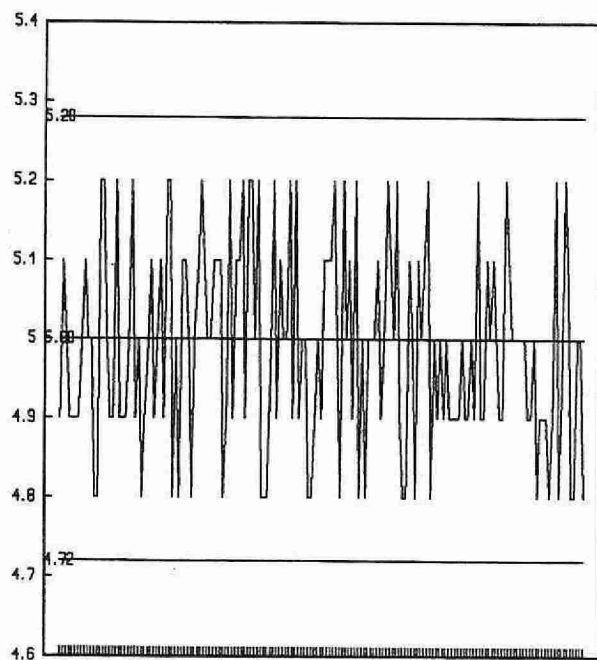
QUALITY CONTROL DATA FROM 04/01/95 TO 21/12/95



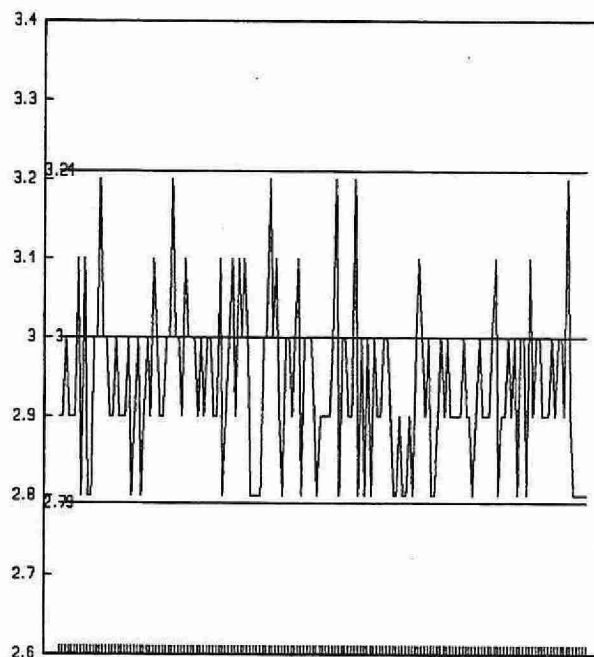
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## CARBON, TOTAL ORGANIC

### IDENTIFICATION:

Laboratory Unit	MISA	Method Introduced	08/12/93
Method Reference No.	E3247B	Units	mg/L as C
LIMS Product Code	CARB3247	Supervisor	J. McBride
Sample Type/Matrix	Industrial Effluents, and Sewage		

### SAMPLING:

Quantity Required	500 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

If particles in the sample are greater than about 2 mm diameter the sample is homogenized and /or pH is lowered if necessary. Automated acidification and purging are done to remove any inorganic carbon at a temperature of 820 C. An IR detector measures the CO<sub>2</sub>.

### INSTRUMENTATION:

Dorhman DC-190 Carbon Analyzer.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

A solution of potassium biphthalate is used to calibrate the instrument.

### CONTROLS:

Calibration	2 Calibration Control Standards, eg QCA.
Blanks	DDW
Drift	25 ppm Check standard and a blank every 10 samples
Precision	Duplicate sample at least every 10 samples to a maximum of three



# CARBON, TOTAL ORGANIC

QUALITY CONTROL DATA FROM 13/01/95 TO 22/12/95

Laboratory Unit: MISA

Full Scale: to 25 mg/L as C

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	54	20.0	19.8	-0.2	0.7411
B:	54	5.0	4.9	-0.1	0.4828
A+B:	54	25.0	24.7	-0.3	0.9893
A-B:	54	15.0	14.98	-0.02	0.7655

s.d.(AB)

S(between runs): 0.62

Sw(within run): 0.54

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

22.9 - 27.1 for A+B  
13.4 - 16.6 for A-B

## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
20	0.0 - 2.5	0.2455	18.6
31	2.6 - 5.0	0.2829	8.1
53	5.1 - 12.5	0.4079	5.0
20	12.6 - 25.0	0.6674	3.6
124	Overall	0.3957	

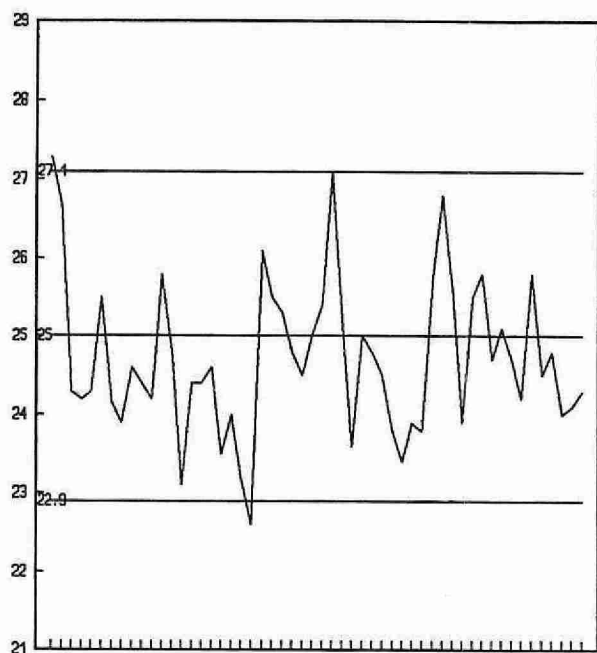
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Method Blank	54	-0.0631	0.3162

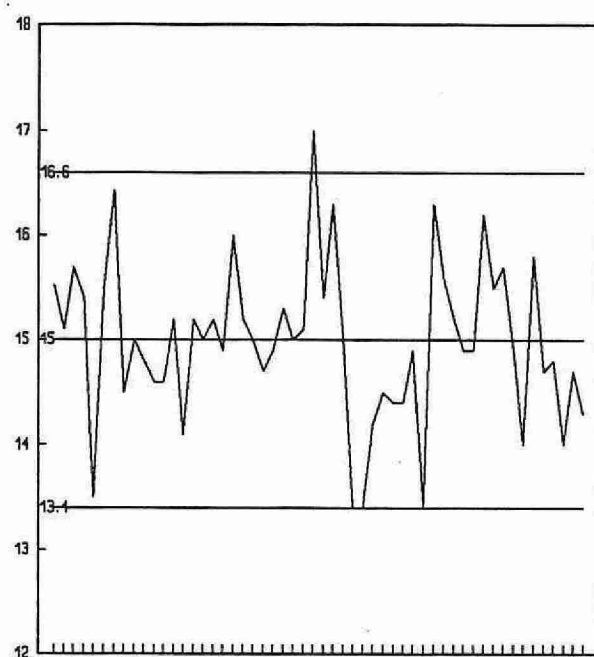


CARBON, TOTAL ORGANIC (mg/L as C)

QUALITY CONTROL DATA FROM 13/01/95 TO 22/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## CARBON, TOTAL PARTICULATE

### IDENTIFICATION:

Laboratory Unit	MISA	Method Introduced	08/12/93
Method Reference No.	E3141A	Units	mg/L as C
LIMS Product Code	CARB3141	Supervisor	F. Lo
Sample Type/Matrix	Surface water, effluents, and sewage		

### SAMPLING:

Quantity Required	1 L
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Water is filtered and the filter is dried overnight at 103°C. The filter plus residue are placed in a combustion boat and burned in an oxygen atmosphere. An IR detector measures the CO<sub>2</sub> produced and is reported as percent carbon.

### INSTRUMENTATION:

LECO CR-12 Carbon Determinator.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

A solution of potassium biphthalate is used to calibrate the instrument.

### CONTROLS:

Calibration	2 Calibration Control Standards, eg QCA.
Blanks	Treated and untreated filters every 10 samples.
Drift	0.01 - 0.015 g KHP check standard
Precision	Duplicate sample at least every 10 samples to a maximum of three

# CARBON, TOTAL PARTICULATE

QUALITY CONTROL DATA FROM 01/01/94 TO 31/12/95

Laboratory Unit: MISA

Full Scale: to 100 mg/L as C

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	11	32.0	33.72	1.72	1.45
B:	11	12.0	12.06	0.06	0.40
A+B:	11	44.0	45.77	1.77	1.58
A-B:	11	20.0	21.66	1.66	1.42

The calibration is accepted if the calibration control values obtained lie within the ranges:

38.32 - 49.68 for A+B

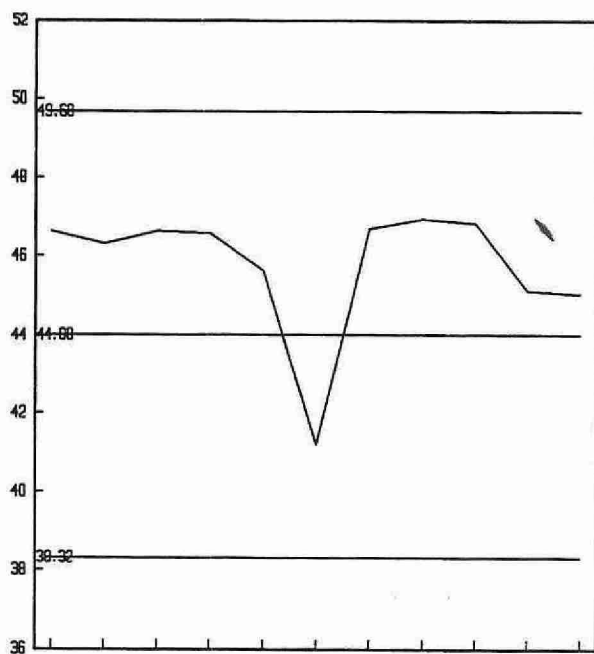
15.74 - 24.26 for A-B

## DUPLICATES:

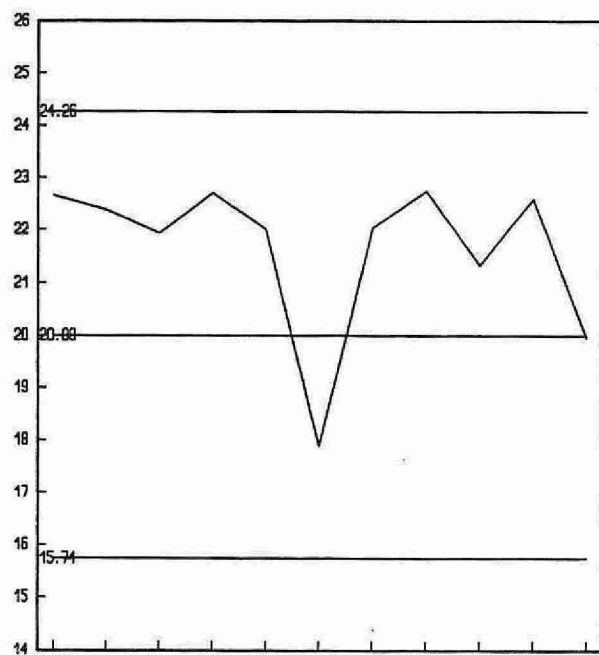
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
11	0 - 1	0.11	17.6
3	2 - 10	0.78	15.6
4	11 - 100	3.23	6.8
18	Overall	0.91	4.0

CARBON, TOTAL PARTICULATE (mg/L as C)

QUALITY CONTROL DATA FROM 01/01/94 TO 31/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## CHLORIDE

### IDENTIFICATION:

Laboratory Unit:	Colourimetry	Method Introduced:	01/05/75
Method Reference No:	E3016A	Units:	mg/L as Cl
LIMS Product Code:	CL3016	Supervisor:	J. McBride
Sample Type/Matrix:	Rivers(non-APIOS), Lakes Soil Extracts, Effluents, Domestic Water Supplies, Leachates, Sewages, Industrial Wastes		

### SAMPLING:

Quantity Required:	10 mL
Container:	Plastic

### ANALYTICAL PROCEDURE:

Chloride ions are combined with mercuric thiocyanate releasing thiocyanate quantitatively. Thiocyanate then reacts with ferric ions to produce ferric thiocyanate (red), and the absorbance of the latter is measured colourimetrically.

Approximate absorbance: 0.5 at the full scale level.

### INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 1.5 cm light path at 480nm.

Data capture, reduction, and processing via a multistage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

BL plus 10 standards

### CONTROLS:

Calibration:	LTBL plus 3 standards, e.g. QCA
Drift:	BL every 10 samples; standard every 20 samples

# CHLORIDE

QUALITY CONTROL DATA FROM 04/01/95 TO 20/12/95

Laboratory Unit: Colourimetry

Full Scale: to 100 mg/L as Cl

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	110	75.0	75.4	0.4	0.2035
B:	110	25.0	25.1	0.1	0.1054
C:	110	5.00	5.00	0.00	0.0655
A+B:	110	100.0	100.6	0.6	0.2187
A-B:	110	50.0	50.3	0.3	0.2391
B+C:	110	30.0	30.1	0.1	0.1346
B-C:	110	20.0	20.1	0.1	0.1126

s.d.(AB) S(between runs): 0.16

Sw(within run): 0.17

S/Sw: 0.94

s.d.(BC) S(between runs): 0.09

Sw(within run): 0.08

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

98.8	-	101.2	for	A+B
49.2	-	50.8	for	A-B
29.3	-	30.7	for	B+C
19.55	-	20.45	for	B-C

## DUPLICATES:

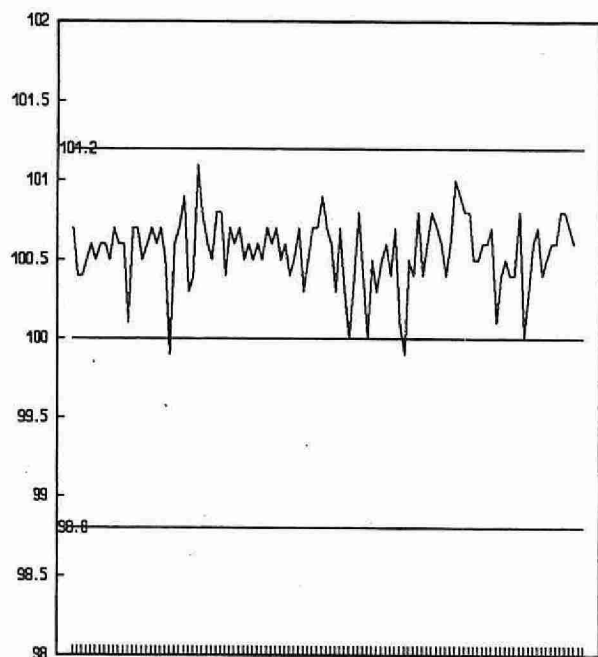
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
89	0.00 - 10.0	0.0682	4.1
77	10.1 - 20.0	0.1289	0.9
78	20.1 - 50.0	0.1593	7.6
48	50.1 - 100	0.3984	0.7
292	Overall	0.1430	

## OTHER CHECKS:

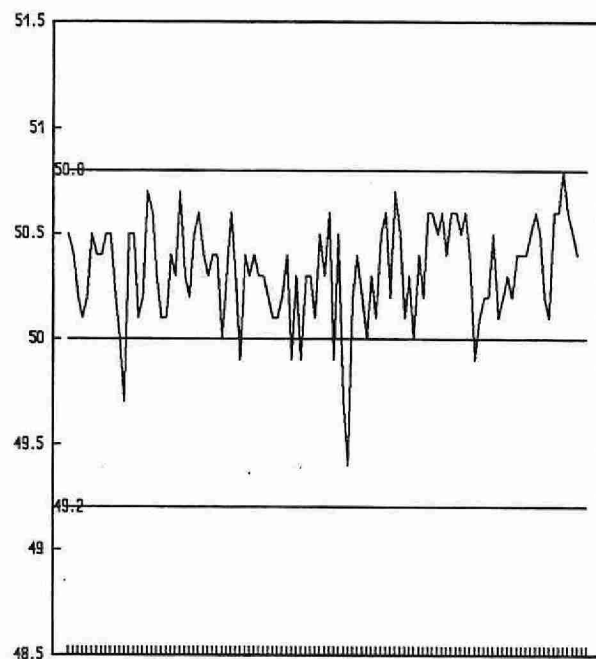
	n	Mean	Standard Deviation (1)
Long Term Blank	110	-0.071	0.1616

CHLORIDE (mg/L as Cl)

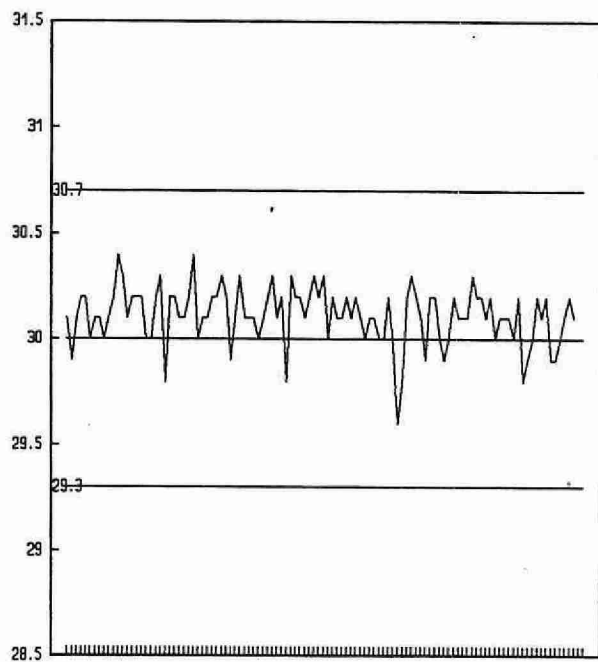
QUALITY CONTROL DATA FROM 04/01/95 TO 20/12/95



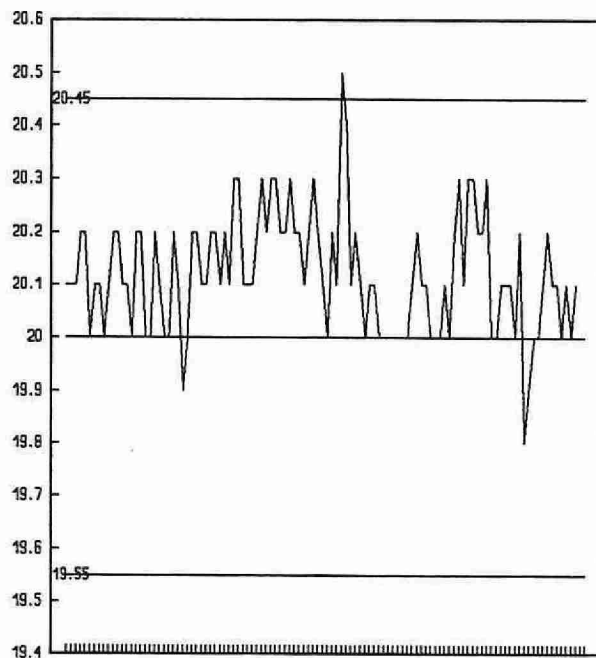
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## CHLORIDE

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/04/78
Method Reference No.	E3147A	Units	mg/L as Cl
LIMS Product Code	ANION3147	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

### SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with  $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$  to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by the comparison of the sample peak heights to a series of standards. Sulphate is determined simultaneously.

### INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	1 standard every 10 samples.



# CHLORIDE

QUALITY CONTROL DATA FROM 04/01/95 TO 20/12/95

Laboratory Unit: Dorset

Full Scale: to 2.0 mg/L as Cl

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	38	1.60	1.601	0.001	0.0119
B:	38	0.40	0.402	0.002	0.0068
A+B:	38	2.00	2.014	0.014	0.0194
A-B:	38	1.20	1.199	-0.001	0.0128

s.d.(AB)      S(between runs): 0.010      Sw(within run): 0.009      S/Sw: 1.07

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.92 - 2.08 for A+B  
1.14 - 1.26 for A-B

## DUPLICATES:

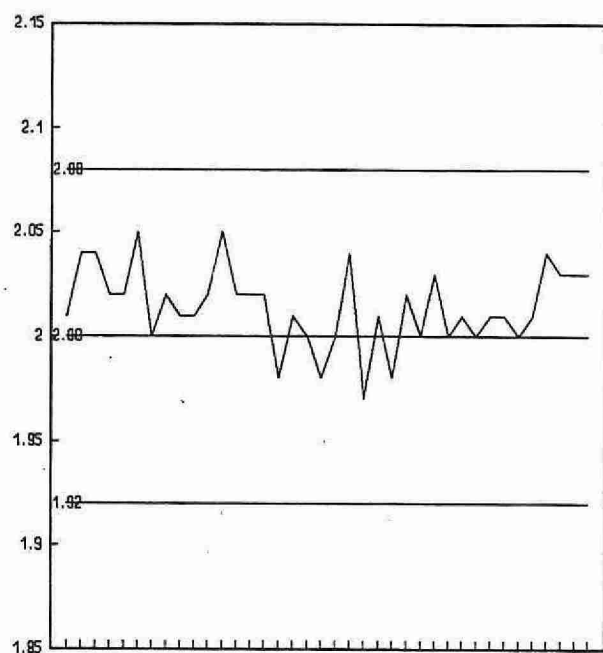
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
30	0.10 - 0.20	0.0074	8.9
49	0.21 - 0.40	0.0076	2.3
23	0.41 - 1.00	0.0087	2.8
10	1.01 - 2.00	0.0237	1.6
112	Overall	0.0085	

## OTHER CHECKS:

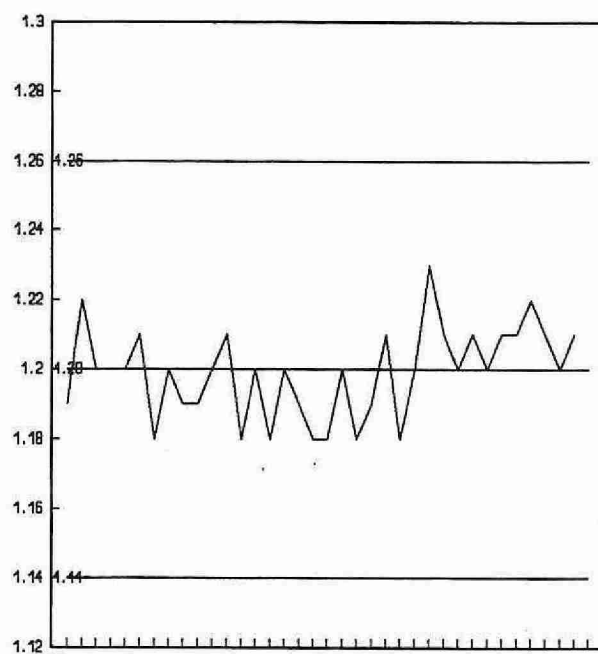
	n	Mean	Standard Deviation (1)
Long Term Blank	38	-0.006	0.0076

CHLORIDE (mg/L as Cl)

QUALITY CONTROL DATA FROM 04/01/95 TO 20/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## CHLORIDE

### IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3148A	Units	µg/Filter as Cl
LIMS Product Code	LOV3148, ANLOV3148	Supervisor	F. Lo
Sample Type/Matrix	W40 filters from LoVol filter packs		

### SAMPLING:

Quantity Required	1 filter
Container	50 mL polypropylene tube

### SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW in polypropylene tubes with ultrasonic treatment followed by a 24 hour rest period.

### ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with  $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$  to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by the comparison of the sample peak heights to a series of standards. Results are converted to µg/filter as Cl. Nitrogen-nitrate and sulphate are determined simultaneously.

### INSTRUMENTATION:

Ultrasonic bath; modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing and partial data processing.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02 mg/L	Current T value: 0.10 mg/L
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### CALIBRATION:

BL plus 9 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

### NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received. To convert unit from mg/L to µg/Filter, the concentration of Cl in mg/L is multiplied by 50 for the W40 filters.

# CHLORIDE

QUALITY CONTROL DATA FROM 13/01/95 TO 26/10/95

Laboratory Unit: Ion Chromatography

Full Scale: to 2.0 mg/L as Cl

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	28	1.60	1.607	0.007	0.0147
B:	28	0.40	0.402	0.002	0.0039
A+B:	28	2.00	2.009	0.009	0.0171
A-B:	28	1.20	1.205	0.005	0.0131

s.d.(AB)    S(between runs): 0.0107    Sw(within run): 0.0092    S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.93    -    2.07    for    A+B  
1.15    -    1.25    for    A-B

## DUPLICATES:

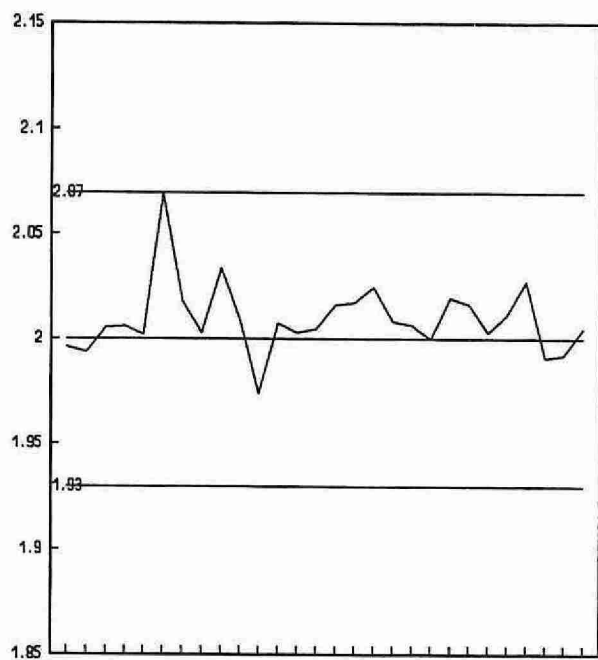
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
16	0 - 0.40	0.0017	0.8
9	0.41 - 1.00	0.0029	0.7
1	1.01 - 2.00	N.A.	N.A.
26	Overall	0.0024	

## OTHER CHECKS:

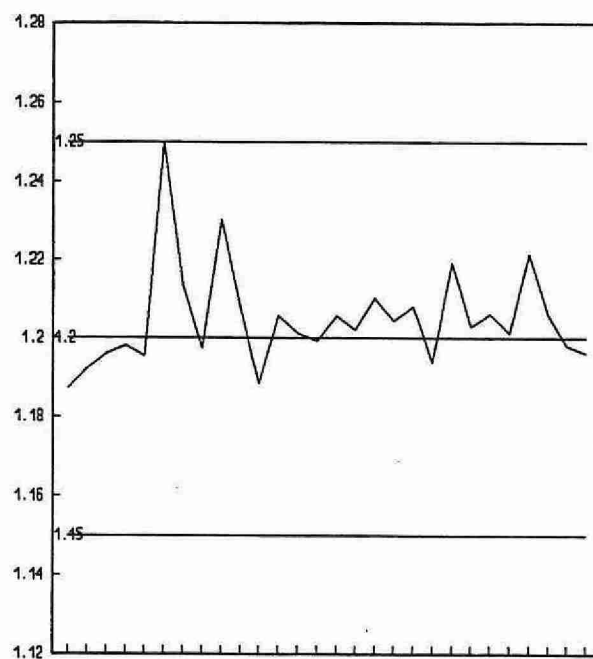
	n	Mean	Standard Deviation (1)
Long Term Blank	28	0	0

CHLORIDE (mg/L as Cl)

QUALITY CONTROL DATA FROM 13/01/95 TO 26/10/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## CHLORIDE

### IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3372A	Units	mg/L as Cl
LIMS Product Code	ANION3372	Supervisor	F. Lo
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

### SAMPLING:

Quantity Required	15 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Chloride is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with  $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$  to match the eluent strength and maintain background conductivity. The concentration of chloride in mg/L as Cl is determined by the comparison of the sample peak heights to a series of standards.

Nitrogen-nitrate and sulphate are determined simultaneously.

### INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

### NOTES:

Same analytical method as E3147A operating in Dorset Lab. New method number introduced for Toronto Lab in 1993 is E3372A.

# CHLORIDE

QUALITY CONTROL DATA FROM 12/01/95 TO 21/12/95

Laboratory Unit: Ion Chromatography

Full Scale: to 1.0 mg/L as Cl

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	19	0.80	0.808	0.008	0.0113
B:	19	0.20	0.206	0.006	0.0100
A+B:	19	1.00	1.014	0.014	0.0160
A-B:	19	0.60	0.602	0.002	0.0141

s.d.(AB)    S(between runs): 0.0106    Sw(within run): 0.0100    S/Sw: 1.07

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.96 - 1.04 for A+B  
0.57 - 0.63 for A-B

## DUPLICATES:

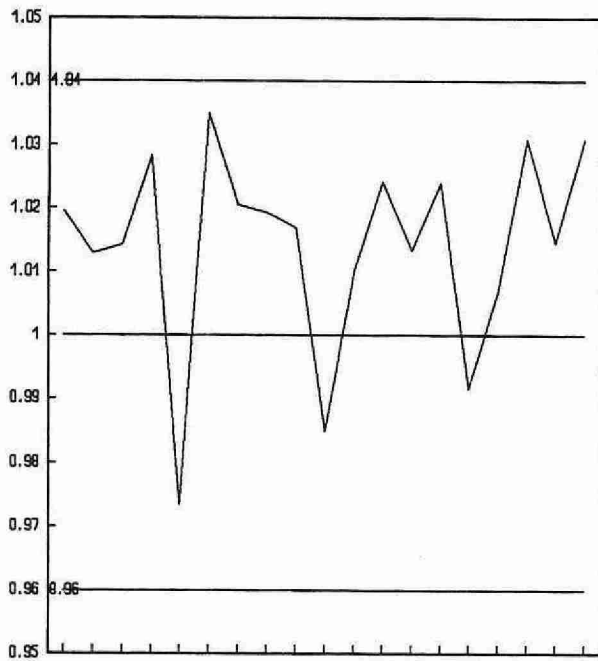
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
20	0.10 - 0.20	0.0121	14.3
6	0.21 - 0.50	0.0082	2.7
0	0.51 - 1.00	N.A.	N.A.
26	Overall	0.0109	

## OTHER CHECKS:

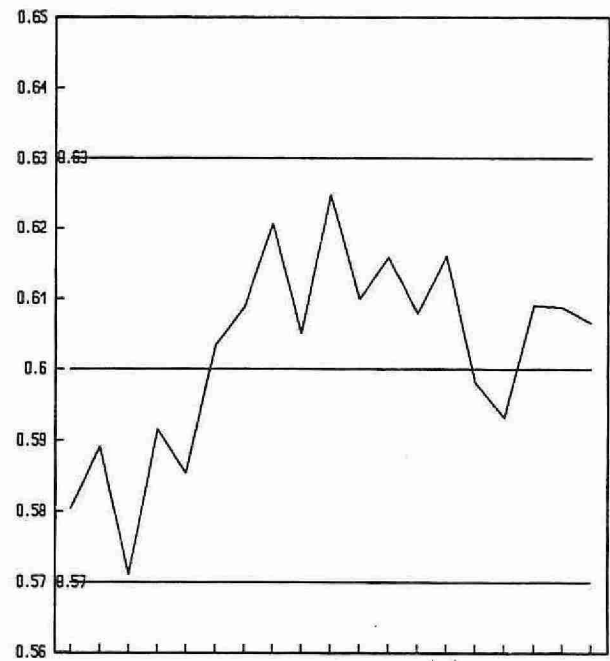
	n	Mean	Standard Deviation (1)
Long Term Blank	19	0.0006	0.0025

CHLORIDE (mg/L as Cl)

QUALITY CONTROL DATA FROM 12/01/95 TO 21/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

\_\_\_\_\_ CONTROL LIMIT



## CHLORINE, TOTAL RESIDUAL

### IDENTIFICATION:

Laboratory Unit:	MISA	Method Introduced:	08/03/93
Method Reference No:	E3309A	Units:	µg/L as Cl <sub>2</sub>
LIMS Product Code:	RCL3309	Supervisor:	F. Lo
Sample Type/Matrix:	Industrial Waste , Sewage, Surface and Treated Drinking Water		

### SAMPLING:

Quantity Required:	1 L
Container:	Narrow neck low actinic glass

### ANALYTICAL PROCEDURE:

Samples are analyzed by amperometric titration. The sample pH is adjusted to between 3.5 and 4.5 with acetate buffer and excess KI is added.

### INSTRUMENTATION:

Autoburette

### REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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### CALIBRATION:

None

### CONTROLS:

Performance Check	BL plus 2 QC standards, e.g., QCA
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### NOTES:

Results recorded for duplicates are based upon final concentrations. The results from various sample aliquots are indicated in each of the concentration spans.

# CHLORINE, TOTAL RESIDUAL

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/95

Laboratory Unit: Colourimetry

Full Scale: to 50.0 µg/L as Cl<sub>2</sub>

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	13	40.0	40.4	0.4	1.5785
B:	13	10.0	11.0	1.0	1.0888
A+B:	13	50.0	51.6	1.6	1.8856
A-B:	13	30.0	29.7	-0.3	1.2428

s.d.(AB)

S(between runs):1.3

Sw(within run): 0.89

S/Sw: 1.5

The calibration is accepted if the calibration control values obtained lie within the ranges:

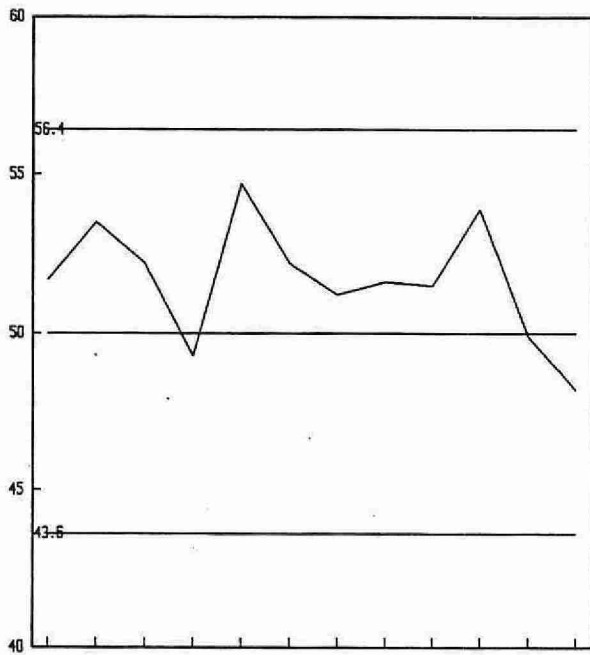
43.6 - 56.4 for A+B  
25.2 - 34.8 for A-B

## DUPLICATES:

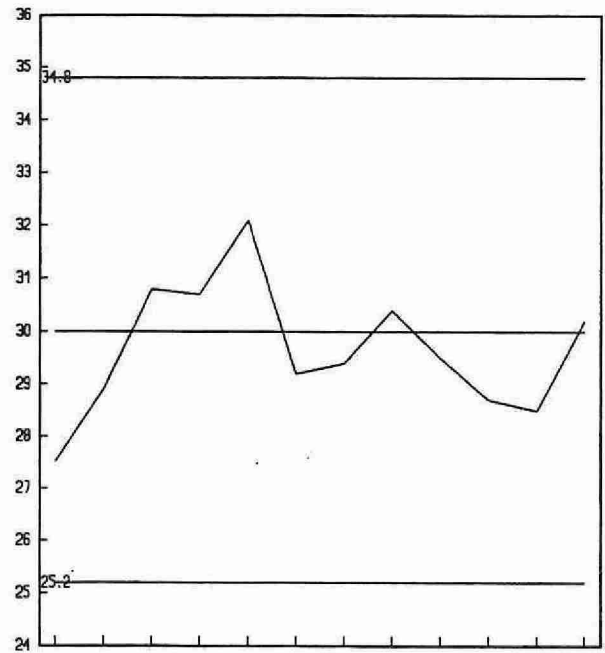
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
1	0 - 10	N.A.	N.A.
1	11 - 25	N.A.	N.A.
5	26 - 50	0.5371	5.3
0	51 - 100	N.A.	N.A.
1	101 - 700	N.A.	N.A.
8	Overall	0.5949	

CHLORINE TOTAL RESIDUAL ( $\mu\text{g/L}$  as  $\text{Cl}_2$ )

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## CHLOROPHYLL

### IDENTIFICATION:

Laboratory Unit:	Colourimetry	Method Introduced:	01/04/75
Method Reference No:	E3169A	Units:	µg/L
LIMS Product Code:	CHL3169	Supervisor:	J. McBride
Sample Type/Matrix:	Rivers, Lakes, Effluents		

### SAMPLING:

Quantity Required	1000 mL for clear samples; 500 mL if visibly green
Container	Glass or plastic
Other	In the field a sample is filtered through a nylon filter. The filter is folded and then placed between two membrane filter-support pads, and the package is enclosed in a plastic dish labelled with the sample number and sample volume filtered, the dish is kept in the dark or wrapped in aluminum foil, and shipped immediately, or kept frozen.

### ANALYTICAL PROCEDURE:

Using a Commodore PET microcomputer-controlled, automated spectrophotometer, two scans are developed with absorbance measurements at 630, 645, and 663 nm for the first scans; the minimum absorbance value between 710 and 750 nm (readings at 5 nm intervals) is utilized as a turbidity correction. Chlorophyll "a" and "b" are calculated from this scan. After automated acidification, the second scan is obtained from the wavelength 665 nm for correcting chlorophyll "a" measurement. SCOR-UNESCO equations are used for all chlorophyll calculations.

### INSTRUMENTATION:

- Automated modular continuous flow scanning spectrophotometer system
- Microcomputer system for control of sampling, timing and data processing (i.e. data capture, calculations and transfer of results to LIMS)

### REPORTING:

Chlorophyll a; corrected Chlorophyll a; total Chlorophyll b; total	Maximum Significant Figures: 3	Current W value: 1.0 Current W value: 0.2 Current W value: 0.1	Current T value: 5.0 Current T value: 1.0 Current T value: 0.5
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### CONTROLS:

Calibration	LTBL plus 2 "standards", e.g.QCA
Drift	"standard", BL every 20 samples

### NOTES:

"Standards" are prepared from chlorophyll "a" and "b", but the materials are neither analytical grade nor are their solutions stable. Thus calibration controls are based on measured averages.

# CHLOROPHYLL "a"

QUALITY CONTROL DATA FROM 06/01/95 TO 21/12/95

Laboratory Unit: Colourimetry

Reporting Unit: µg/L

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	105	3.0	2.981	-0.019	0.0778
B:	105	1.0	1.013	0.013	0.0539
A+B:	105	4.0	3.994	-0.006	0.1041
A-B:	105	2.0	1.968	-0.032	0.0842

s.d.(AB)

S(between runs): 0.07

Sw(within run): 0.06

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

3.6 - 4.4 for A+B  
1.7 - 2.3 for A-B

## DUPLICATES:

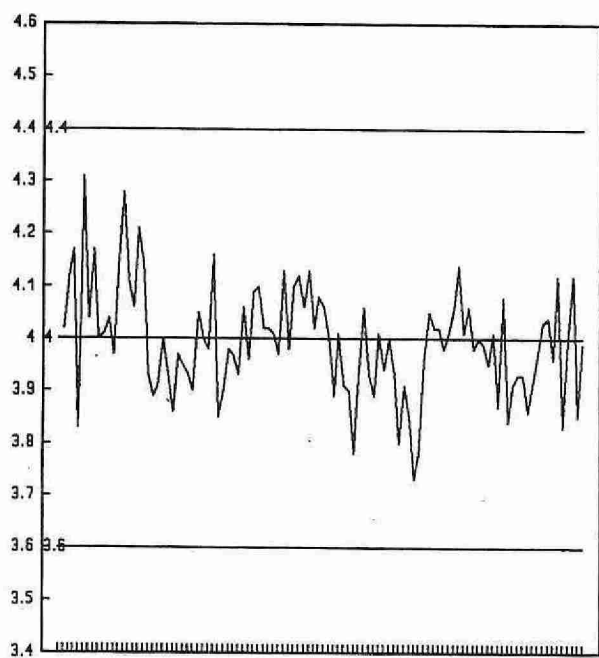
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
96	-0.17 - 5.0	0.3383	17.6
29	5.1 - 10.0	0.6933	8.7
20	10.1 - 25.0	0.6424	3.9
8	25.1 - 50.0	2.1700	6.0
23	50.1 - 420	11.291	8.5
176	Overall	4.1306	

## OTHER CHECKS:

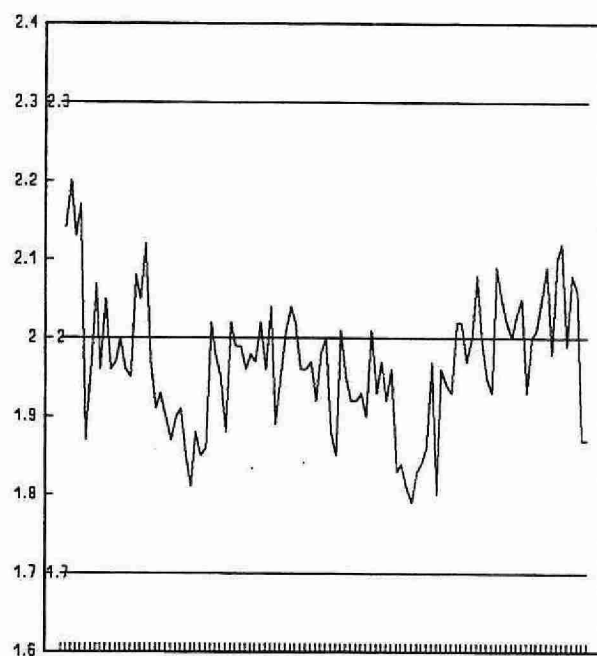
	n	Mean	Standard Deviation (1)
Long Term Blank	105	0.0486	0.0482
Filtered Blank	105	0.0521	0.0684

# CHLOROPHYLL, "a" ( $\mu\text{g/L}$ )

QUALITY CONTROL DATA FROM 06/01/95 TO 21/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

# CHLOROPHYLL "a", ACIDIFIED

QUALITY CONTROL DATA FROM 06/01/95 TO 21/12/95

Laboratory Unit: Colourimetry

Reporting Unit: µg/L

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	105	2.4	2.577	0.177	0.1503
B:	105	0.8	0.838	-0.038	0.1195
A+B:	105	3.2	3.416	0.216	0.2250
A-B:	105	1.6	1.739	0.139	0.1519

s.d.(AB)

S(between runs): 0.14

Sw(within run): 0.11

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.4 - 4.0 for A+B  
1.0 - 2.0 for A-B

## DUPLICATES:

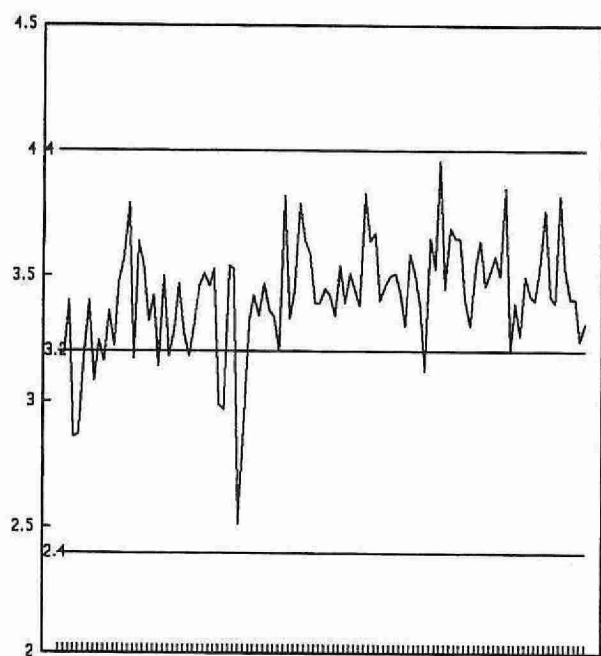
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
52	-0.34 - 1.0	0.3545	161.5
25	1.1 - 2.0	0.4352	32.7
41	2.1 - 5.0	0.4836	15.8
25	5.1 - 10.0	0.8652	16.0
38	10.1 - 100	5.1254	18.6
6	101 - 300	15.941	8.8
187	Overall	0.8987	

## OTHER CHECKS:

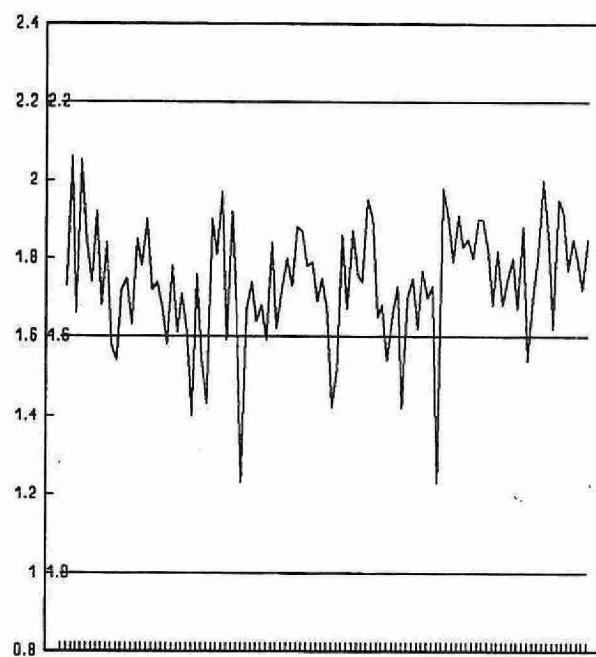
	n	Mean	Standard Deviation (1)
Long Term Blank	105	0.0978	1.1203
Filtered Blank	105	0.0087	0.3687

CHLOROPHYLL "a", ACIDIFIED ( $\mu\text{g/L}$ )

QUALITY CONTROL DATA FROM 06/01/95 TO 21/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT



# CHLOROPHYLL "b"

QUALITY CONTROL DATA FROM 06/01/95 TO 21/12/95

Laboratory Unit: Colourimetry

Reporting Unit: µg/L

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	105	3.0	2.038	0.038	0.0939
B:	105	1.0	1.040	0.040	0.0738
A+B:	105	4.0	4.078	0.078	0.1405
A-B:	105	2.0	1.997	-0.003	0.0937

s.d.(AB)

S(between runs): 0.08

Sw(within run): 0.07

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

3.6 - 4.4 for A+B  
1.7 - 2.3 for A-B

## DUPLICATES:

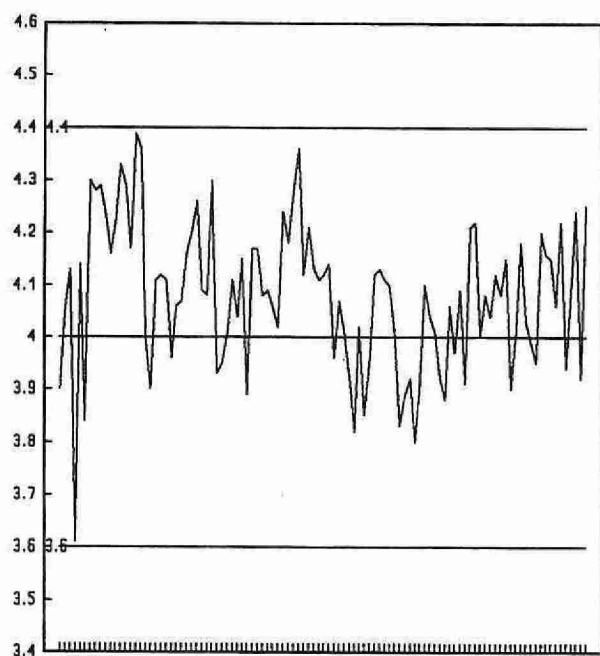
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
119	-0.25 - 1.0	0.1509	41.2
32	1.1 - 2.0	0.2332	17.0
15	2.1 - 5.0	0.6636	21.3
11	5.1 - 10.0	1.1344	12.8
17	10.1 - 60.0	3.1377	14.4
194	Overall	0.2651	

## OTHER CHECKS:

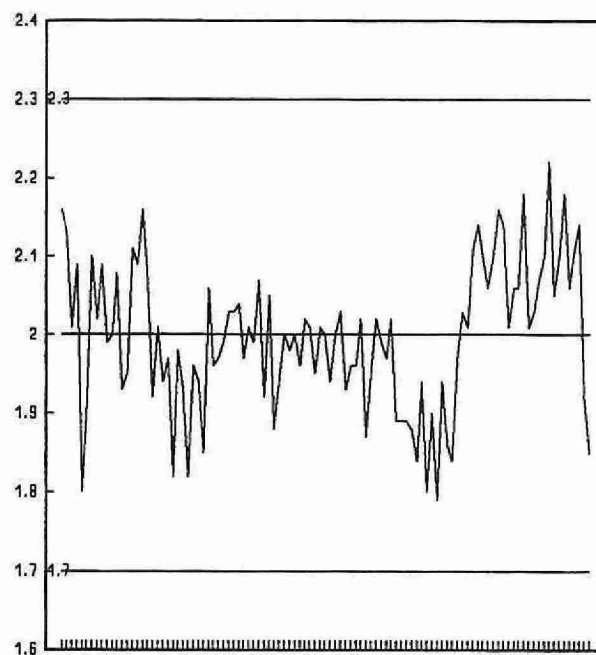
	n	Mean	Standard Deviation (1)
Long Term Blank	105	0.0692	0.0783
Filtered Blank	105	0.0681	0.1020

CHLOROPHYLL, "b" ( $\mu\text{g/L}$ )

QUALITY CONTROL DATA FROM 06/01/95 TO 21/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

\_\_\_\_\_ CONTROL LIMIT

## COLOUR, TRUE

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	15/10/80
Method Reference No.	E3025A	Units	TCU
LIMS Product Code	COL3025	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes		

### SAMPLING:

Quantity Required:	25 mL
Container:	Glass or plastic

### ANALYTICAL PROCEDURE:

True colour is measured on a settled sample colourimetrically in a system calibrated with acidified chloroplatinate standards. Colour is measured using a 400-450 nm broadband blue filter.  
Approximate absorbance: 0.20 at the full scale level.

### INSTRUMENTATION:

One colourimeter with broadband blue filter (400-450 nm)  
One autosampler and chart-recorder  
One Gilson pump

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

6 acidified chloroplatinate standards, 10, 20, 40, 60, 80, 100 TCU

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA, QCB, QCC
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### NOTES:

Slope factor is changed whenever light source in a colourimeter or cell is replaced. This is accomplished by analyzing 7 standards.

# COLOUR, TRUE

QUALITY CONTROL DATA FROM 12/01/95 TO 20/12/95

Laboratory Unit: Dorset

Analytical Range: to 100 TCU

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	32	75	75.45	0.45	0.7696
B:	32	25	25.62	0.62	0.5355
C:	32	5	5.16	0.16	0.3348
A+B:	32	100	100.00	0.00	1.2197
A-B:	32	50	49.83	-0.17	0.8593
B+C:	32	30	29.71	-0.29	0.8194
B-C:	32	20	20.46	0.46	0.5891

s.d.(AB) S(between runs): 0.66 Sw(within run): 0.61 S/Sw: 1.1

s.d.(BC) S(between runs): 0.45 Sw(within run): 0.42 S/Sw: 1.1

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

96.7	-	103.3	for	A+B
47.5	-	52.5	for	A-B
27.7	-	32.3	for	B+C
18.2	-	21.8	for	B-C

## DUPLICATES:

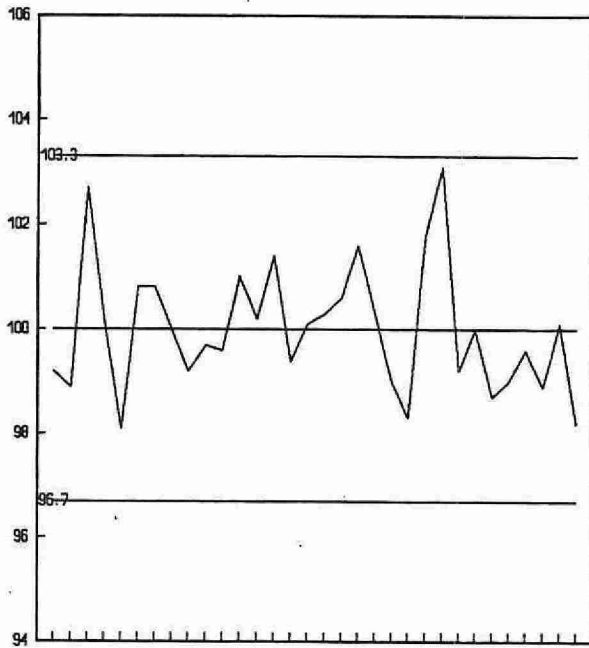
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
1	0.0 - 10.0	N.A.	N.A.
17	10.1 - 20.0	0.3292	2.5
58	20.1 - 50.0	0.5933	6.5
16	50.1 - 100.0	0.5814	1.1
92	Overall	0.5421	

## OTHER CHECKS:

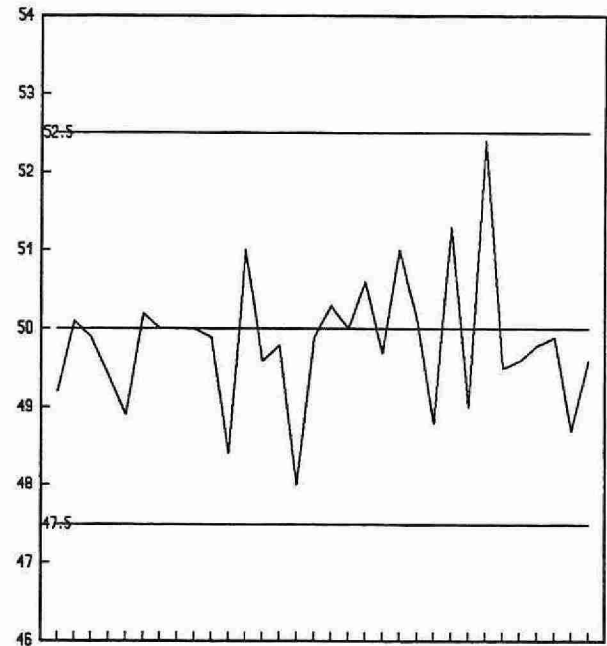
	n	Data Mean	Standard (1) Deviation
Long Term Blank	32	0.5343	0.3597

COLOUR, TRUE (TCU)

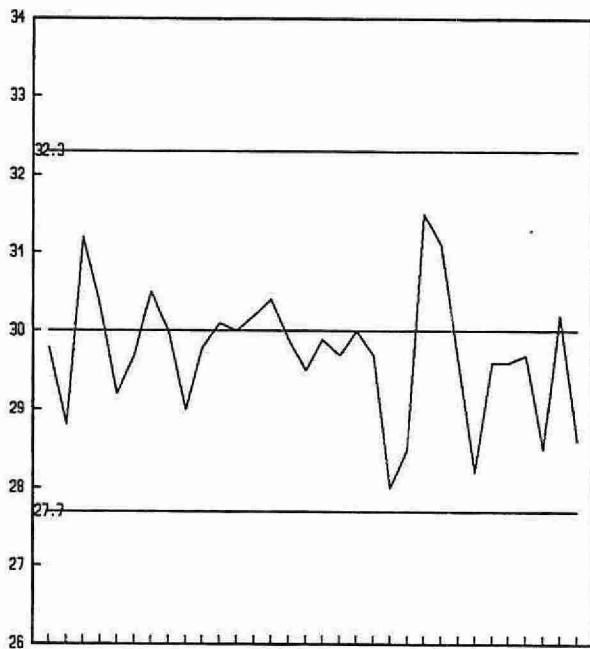
QUALITY CONTROL DATA FROM 12/01/95 TO 20/12/95



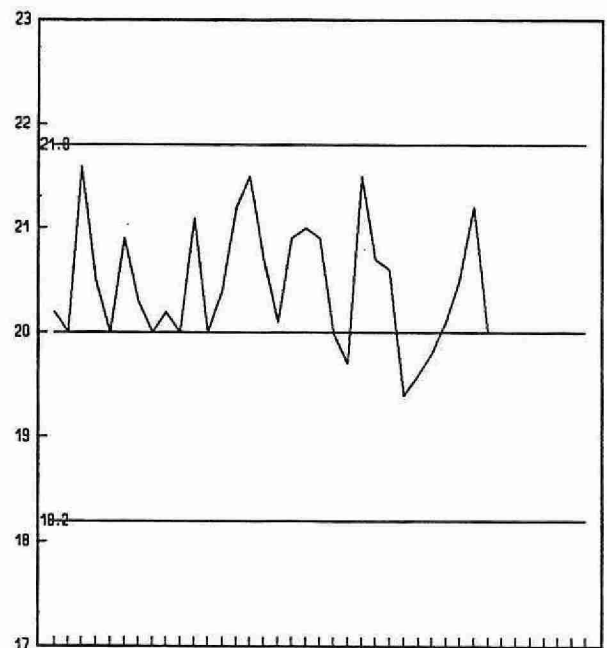
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## COLOUR, TRUE

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	13/03/84
Method Reference No	E3219A	Units	TCU
LIMS Product Code	COL3219	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Effluents, Surface Waters, Industrial Wastes, Leachates		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

True colour is measured colourimetrically on the supernatant of a settled sample in a system calibrated with acidified chloroplatinate standards. The sample stream is measured using a broadband blue filter. Residual turbidity effects are suppressed by using a broadband red filter and increased path length in the reference stream.

Approximate absorbance: 0.3 at the full scale level.

### INSTRUMENTATION:

Basic automated modular continuous flow system. Colour measurement is through a 3.0 cm. light path using a broadband filter (400-450 nm). Turbidity measurement is through a 5.0 cm. light path using a different broadband filter (660-740 nm). Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

BL plus 6 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

# COLOUR, TRUE

QUALITY CONTROL DATA FROM 09/01/95 TO 21/12/95

Laboratory Unit: Colourimetry

Full Scale: to 100 TCU

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	54	70.0	71.0	1.0	0.4343
B:	54	25.0	25.1	0.1	0.3218
C:	54	7.50	7.85	0.35	0.3272
A+B:	54	95.0	96.1	1.1	0.5948
A-B:	54	45.0	45.9	0.9	0.4801
B+C:	54	32.5	32.9	0.4	0.5051
B-C:	54	17.5	17.2	-0.3	0.4076

s.d.(AB) S(between runs): 0.38

Sw(within run): 0.34

S/Sw: 1.1

s.d.(BC) S(between runs): 0.32

Sw(within run): 0.29

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

92.18	-	97.82	for	A+B
42.89	-	47.11	for	A-B
30.65	-	34.35	for	B+C
16.11	-	18.89	for	B-C

## DUPLICATES:

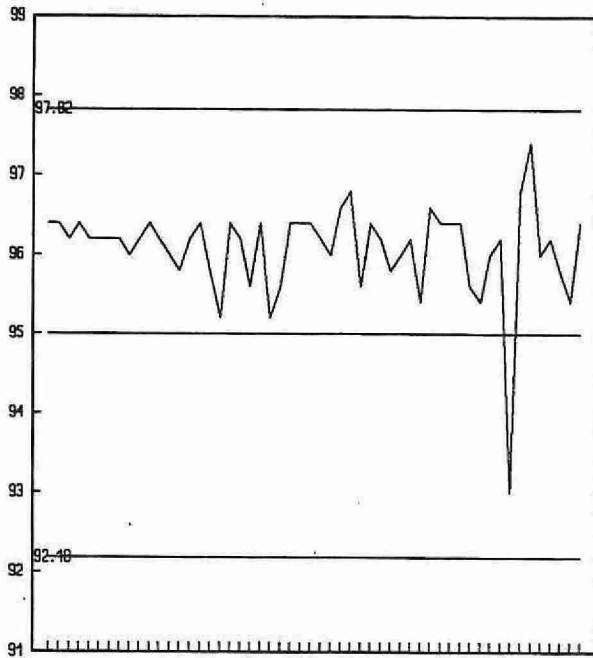
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
117	0.00 - 10.0	0.4107	18.6
29	10.1 - 20.0	0.3290	2.9
14	20.1 - 50.0	0.7045	2.2
0	50.1 - 100	N.A.	N.A.
160	Overall	0.4264	

## OTHER CHECKS:

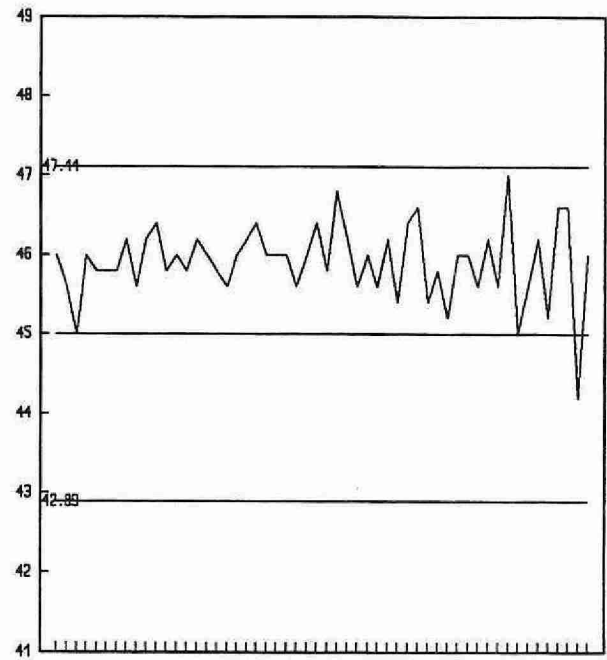
	n	Mean	Standard Deviation (1)
Long Term Blank	54	0.1074	0.8634

COLOUR, TRUE (TCU)

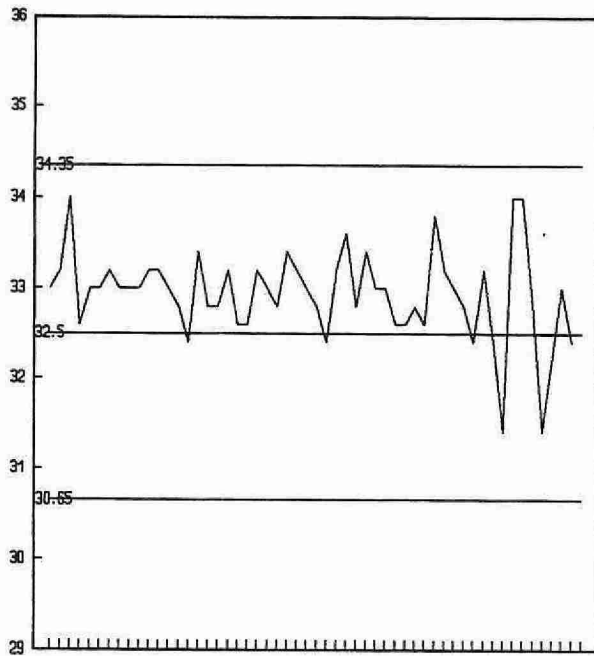
QUALITY CONTROL DATA FROM 09/01/95 TO 21/12/95



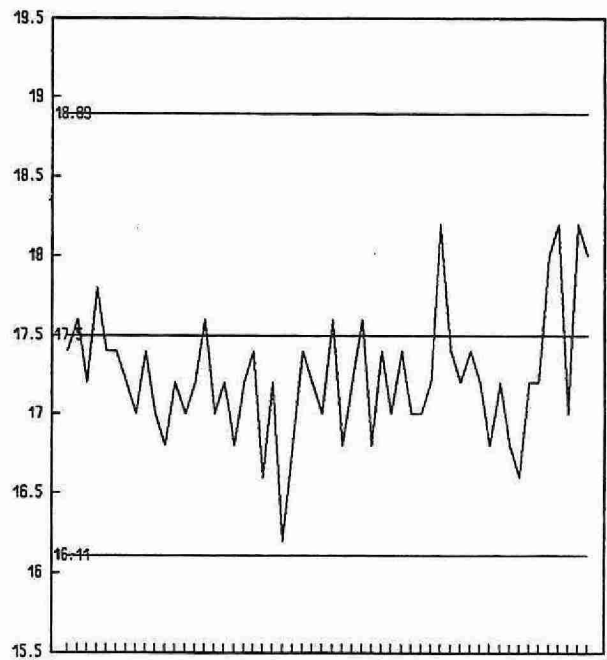
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

CONTROL LIMIT



## CONDUCTIVITY

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/06/76
Method Reference No.	E3024B	Units	$\mu\text{S}/\text{cm}$ at 25°C
LIMS Product Code	COND3024	Supervisor	J. McBride
Sample Type/Matrix	Streams, Lakes, Precipitation, Soil Leachates		

### SAMPLING:

Quantity Required	75 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

The sample is introduced into a jacketed conductivity cell. The conductivity is calculated from the chart record.

### INSTRUMENTATION:

Conductivity meter with cell enclosed in a water jacket; temperature controlled water circulator. One autosampler, Gilson pump and dual-range chart recorder.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

5 KCl standards, 10.2, 30.6, 50.8, 101.1, 151 S

### CONTROLS:

Calibration	LTBL plus 4 standards, e.g. QCA
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### NOTES:

The control standards are corrected for the LTB from which they are made.

# CONDUCTIVITY

QUALITY CONTROL DATA FROM 12/01/95 TO 20/12/95

Laboratory Unit: Dorset

Analytical Range: to 500  $\mu$ S/cm

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	34	146.7	147.28	0.58	0.7136
B:	34	51.8	52.68	0.88	0.7560
C:	34	51.8	52.51	0.78	0.6517
D:	34	14.9	15.54	0.64	0.2804
A+B:	34	198.5	198.89	0.39	1.0745
A-B:	34	94.9	94.6	-0.3	1.0132
C+D:	34	66.7	67.06	0.36	0.7321
C-D:	34	36.9	36.97	0.07	0.6387

s.d.(AB) S(between runs): 0.74

Sw(within run): 0.72

S/Sw: 1.03

s.d.(CD) S(between runs): 0.50

Sw(within run): 0.45

S/Sw: 1.11

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

195	-	202	for	A+B
92.2	-	97.6	for	A-B
64.9	-	68.5	for	C+D
35.6	-	38.2	for	C-D

## DUPLICATES:

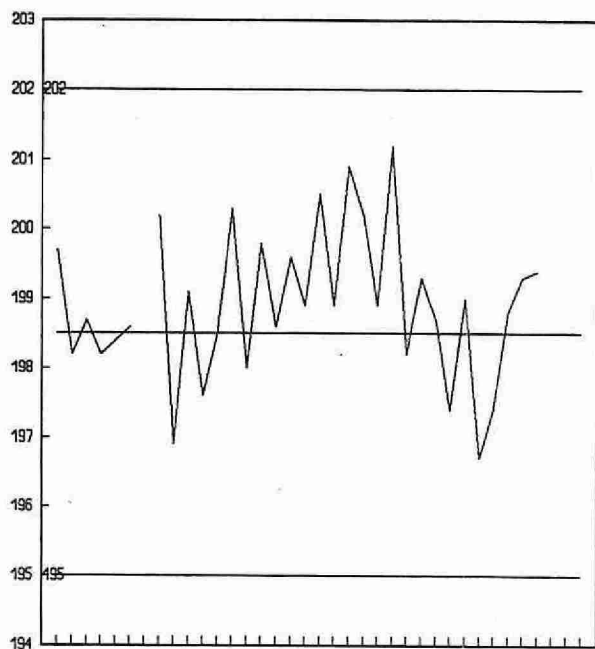
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
94	0.00 - 50.0	0.6292	3.0
4	50.1 - 100.0	1.7165	2.2
2	100.1 - 250.0	N.A.	N.A.
0	250.1 - 500.0	N.A.	N.A.
100	Overall	0.6665	

## OTHER CHECKS:

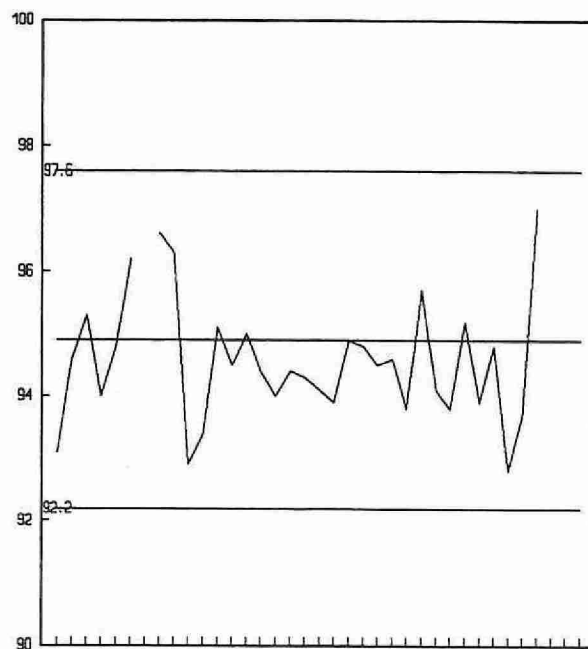
	n	Mean	Standard Deviation (1)
Long Term Blank	38	0.4947	0.3040

# CONDUCTIVITY ( $\mu\text{S}/\text{cm}$ )

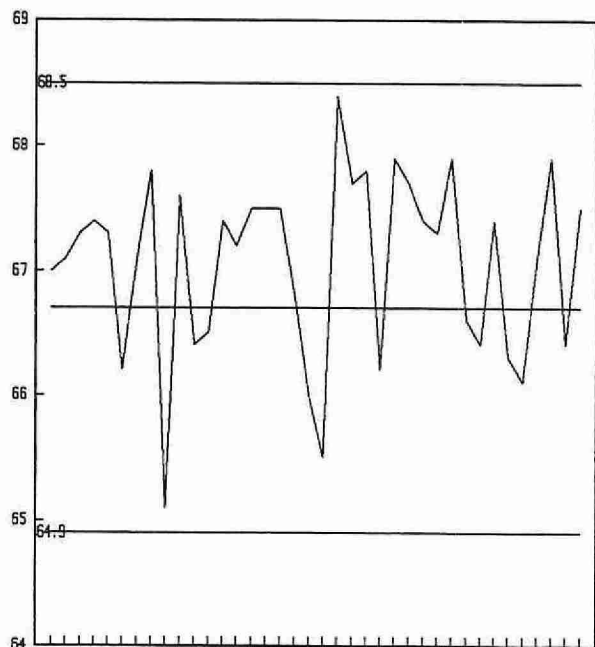
QUALITY CONTROL DATA FROM 12/01/95 TO 20/12/95



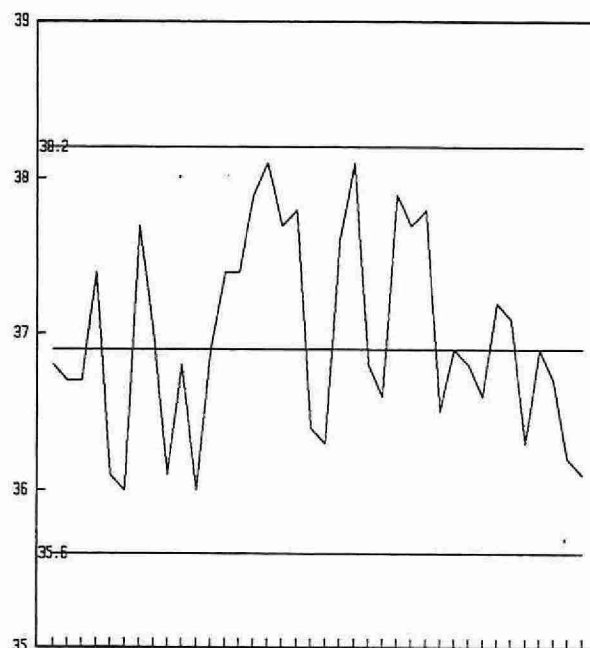
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

CONTROL LIMIT

## CONDUCTIVITY

### IDENTIFICATION:

Laboratory Unit:	Ion Chromatography	Method Introduced:	01/04/78
Method Reference No:	E3177A	Units:	$\mu\text{S}/\text{cm}$ at 25°C
LIMS Product Code:	COND3177	Supervisor:	F. Lo
Sample Type/Matrix:	Precipitation, Throughfall, Stemflow		

### SAMPLING:

Quantity Required:	15 mL
Container:	Glass or plastic

### ANALYTICAL PROCEDURE:

After equilibration at 25°C, The conductivity of the sample is measured.

### INSTRUMENTATION:

Automated modular continuous flow conductivity system comprised of sampler, water bath, conductivity meter with cell, chart recorder.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

1 standard

### CONTROLS:

Calibration:	LTBL plus 2 standards, e.g. QCA
Drift:	1 solution every 10 samples

### NOTES:

A calibration standard for the ion chromatographic system is used to monitor the drift for the conductivity system, but its theoretical conductivity is unknown.

# CONDUCTIVITY

QUALITY CONTROL DATA FROM 12/01/95 TO 25/09/95

Laboratory Unit: Ion Chromatography

Full Scale: to 100.0  $\mu\text{S}/\text{cm}$

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	15	44.5	45.8	1.3	0.7528
B:	15	7.5	8.3	0.8	0.3086
A+B:	15	52.0	54.1	2.1	0.8904
A-B:	15	37.0	37.4	0.4	0.7287

s.d.(AB) S(between runs): 0.57

Sw(within run): 0.51

S/Sw: 1.12

The calibration is accepted if the calibration control values obtained lie within the ranges:

47.76 - 56.24 for A+B

33.82 - 40.18 for A-B

## DUPLICATES:

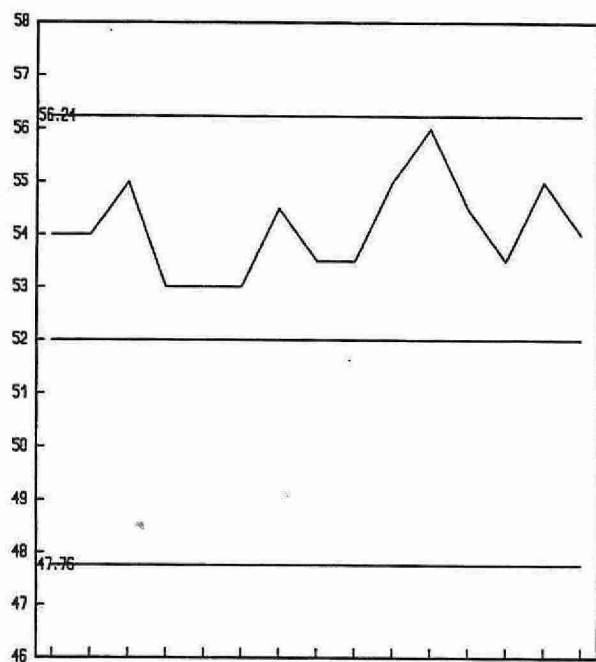
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
20	0.0 - 20.0	0.5062	5.4
12	20.1 - 50.0	0.4628	1.3
0	50.1 - 100.0	N.A.	N.A.
32	Overall	0.3872	

## OTHER CHECKS:

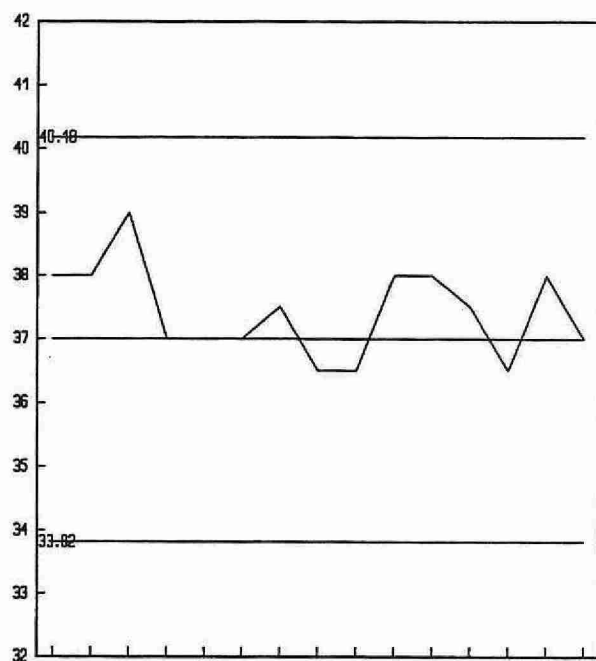
	n	Mean	Standard Deviation (1)
Long Term Blank	15	1.0667	0.3200

CONDUCTIVITY ( $\mu\text{S}/\text{cm}$ )

QUALITY CONTROL DATA FROM 12/01/95 TO 25/09/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

\_\_\_\_\_ CONTROL LIMIT

## CONDUCTIVITY

### IDENTIFICATION:

Laboratory Unit:	Titration	Method Introduced:	01/04/74
Method Reference No:	E3218A	Units:	$\mu\text{S}/\text{cm}$ at 25°C
LIMS Product Code:	PHALCO3218,CONDPH3218	Supervisor:	F. Lo
Sample Type/Matrix:	Domestic Waters, Sewage, Industrial effluents		

### SAMPLING:

Quantity Required:	25 mL
Container:	Glass or plastic

### ANALYTICAL PROCEDURE:

After equilibration at 25°C, the conductivity of the sample is measured. pH, and total fixed endpoint alkalinity are determined simultaneously.

### INSTRUMENTATION:

Automated modular continual flow conductivity system comprising of a sampler, water bath, pump, conductivity meter with cell plus microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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### CONTROLS:

Calibration:	LTBL plus 3 standards, e.g. QCA
Drift:	In run standards throughout the run (tap water diluted to 50% V/V)

# CONDUCTIVITY

QUALITY CONTROL DATA FROM 05/01/95 TO 29/12/95

Laboratory Unit: Titration

Analytical Range: to 2000  $\mu\text{S}/\text{cm}$

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	107	1413.0	1410.7	-2.3	4.6986
B:	107	717.8	716.5	-1.3	1.9439
C:	107	717.8	716.5	-1.3	1.9439
D:	107	147.0	147.5	0.5	0.9941
A+B:	107	2130.8	2127.2	-3.6	5.7713
A-B:	107	695.2	694.3	-0.9	4.3035
C+D:	107	864.8	864.0	-0.8	2.1122
C-D:	107	570.8	569.0	-1.8	2.2526

s.d.(AB)    S(between runs): 3.60                      Sw(within run): 3.04                      S/Sw: 1.2

s.d.(CD)    S(between runs): 1.54                      Sw(within run): 1.59                      S/Sw: 0.97

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

2108.8	-	2152.8	for	A+B
678.7	-	711.7	for	A-B
852.96	-	876.64	for	C+D
561.92	-	579.68	for	C-D

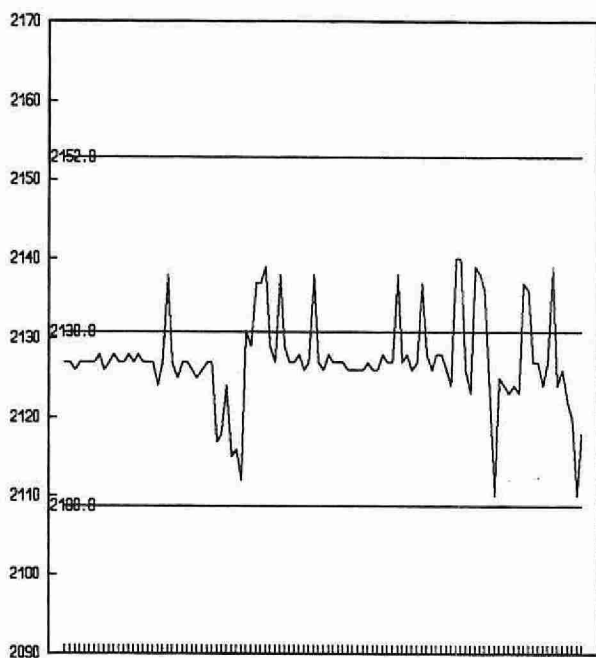
## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
99	0 - 400	1.2502	0.5
103	401 - 1000	4.5905	0.7
29	1001 - 2000	8.2284	0.6
13	2001 - 10000	10.000	0.3
244	Overall	2.6030	

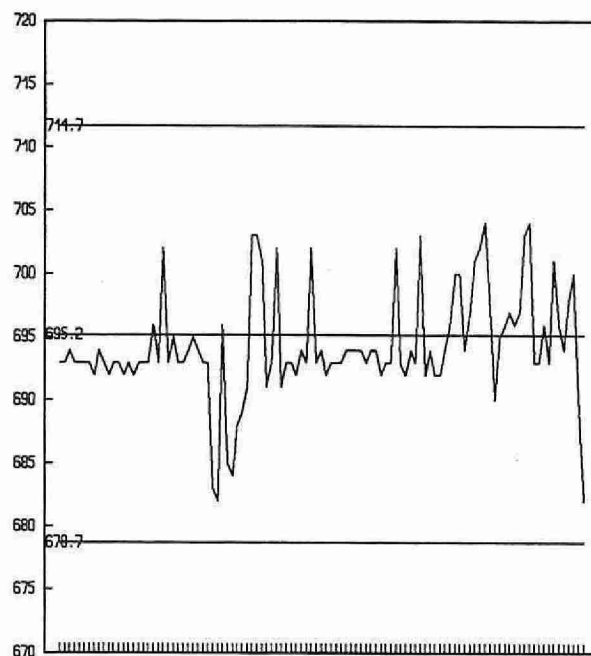


# CONDUCTIVITY ( $\mu\text{S}/\text{cm}$ )

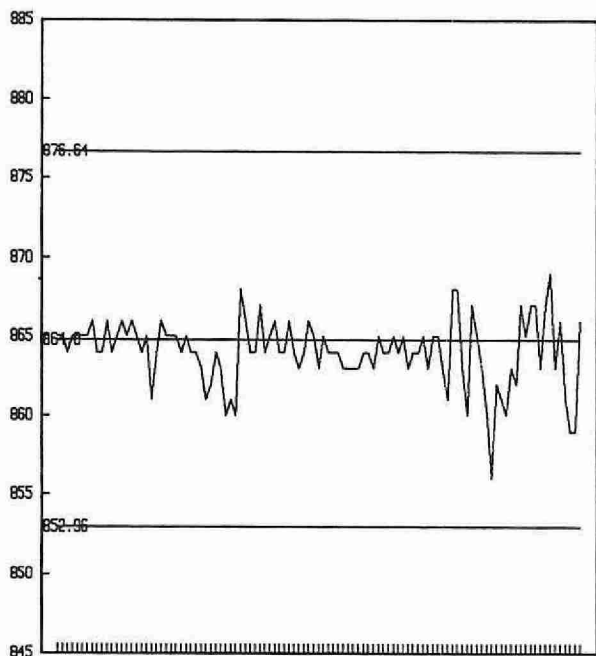
QUALITY CONTROL DATA FROM 05/01/95 TO 29/12/95



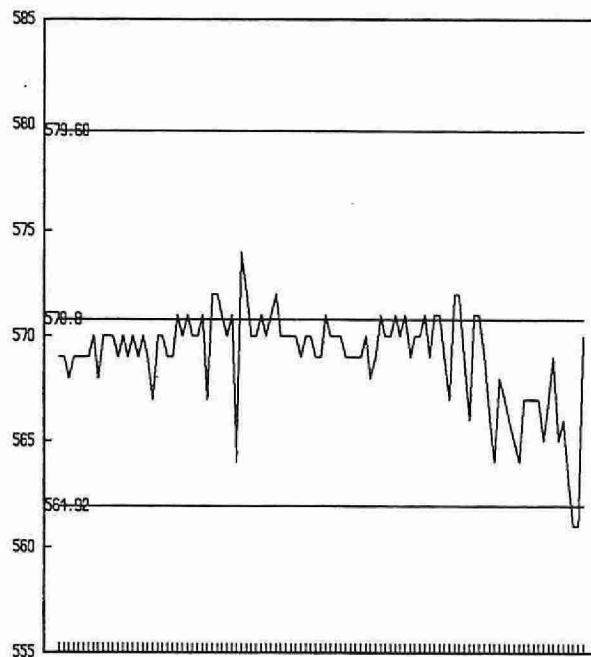
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

CONTROL LIMIT

## CONDUCTIVITY

### IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	20/05/87
Method Reference No	E3228A	Units	$\mu\text{S}/\text{cm}$ at 25°C
LIMS Product Code	PHALK3228,COND3228	Supervisor	F. Lo
Sample Type/Matrix	Landfill leachates		

### SAMPLING:

Quantity Required	75 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

After equilibration at 25°C, the conductivity of the sample is measured; samples are filtered first if necessary. Analysis is performed on supernatant or filtrate.

### INSTRUMENTATION:

Conductivity meter with cell enclosed in a water jacket; temperature controlled water circulator.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 5	Current T value: 25
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### CONTROLS:

Calibration	BL plus 4 standards, e.g. QCA
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# CONDUCTIVITY

QUALITY CONTROL DATA FROM 25/01/95 TO 01/12/95

Laboratory Unit: Titration

Analytical Range: to 10000  $\mu\text{S}/\text{cm}$

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	25	6668	6644	-24	28.0000
B:	25	2767	2757	-10	12.0830
C:	25	1413	1410	-3	5.3852
D:	25	717	718	1	3.1225
A+B:	25	9435	9402	-33	33.9951
A-B:	25	3901	3887	-14	26.5393
C+D:	25	2130	2127	-3	6.9702
C-D:	25	696	692	-4	5.3774

s.d.(AB)    S(between runs): 21.6                      Sw(within run): 18.8                      S/Sw: 1.1

s.d.(CD)    S(between runs): 4.40                      Sw(within run): 3.80                      S/Sw: 1.2

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

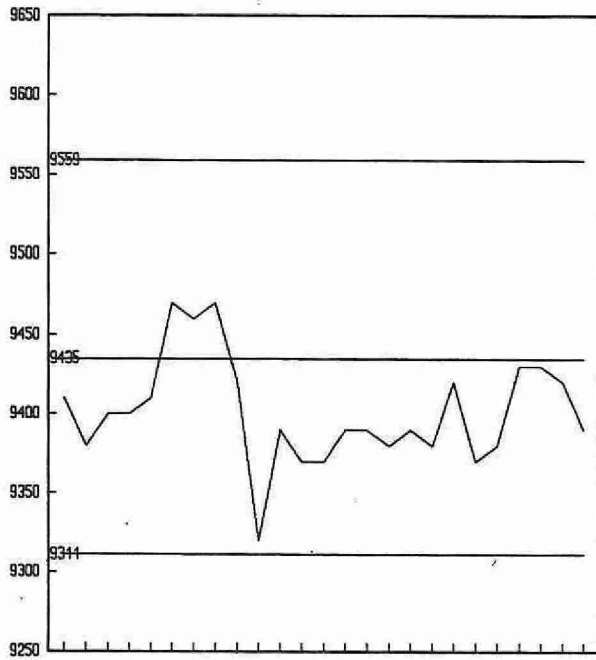
9311	-	9559	for	A+B
3808	-	3994	for	A-B
2094	-	2167	for	C+D
668	-	724	for	C-D

## DUPLICATES:

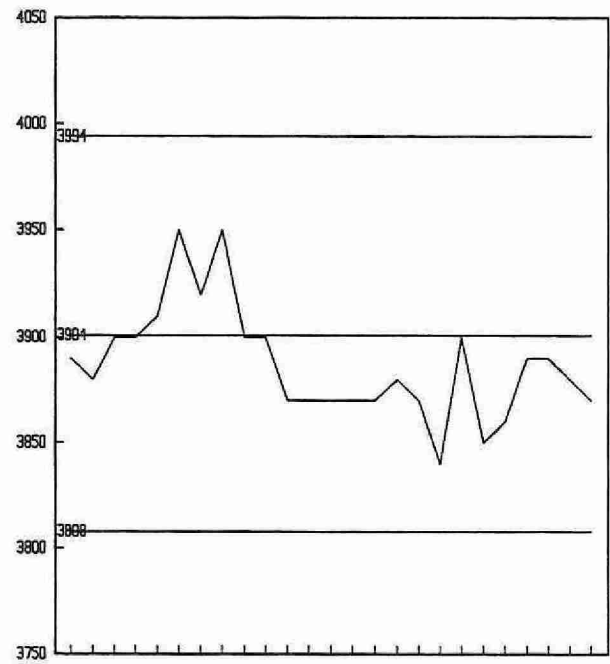
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
55	0 - 1000	2.6110	1.0
8	1001 - 2000	8.8247	0.6
3	2001 - 10000	10.0000	0.2
66	Overall	4.4014	

# CONDUCTIVITY ( $\mu\text{S}/\text{cm}$ )

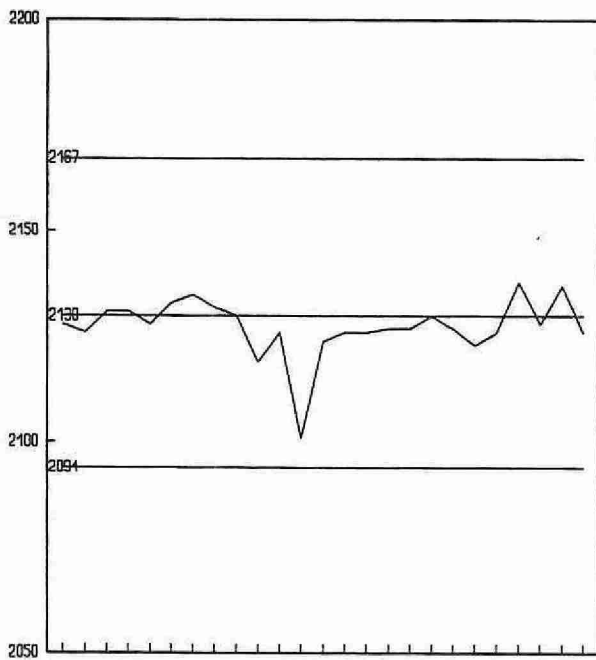
QUALITY CONTROL DATA FROM 25/01/95 TO 01/12/95



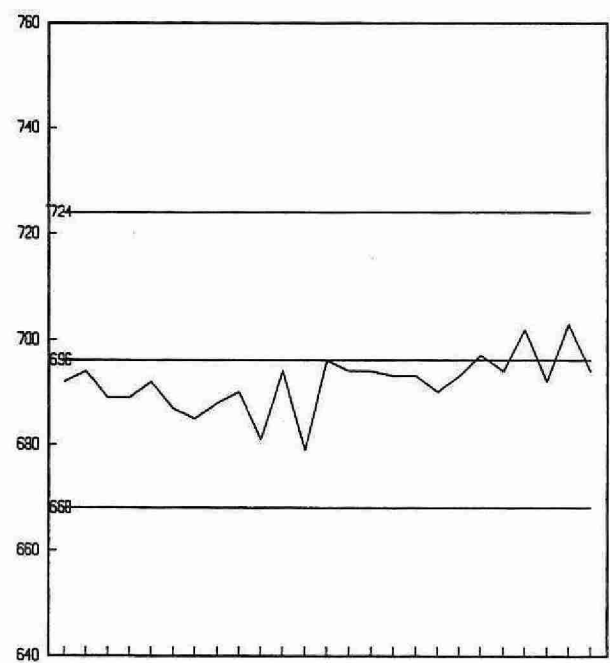
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

CONTROL LIMIT

## CONDUCTIVITY

### IDENTIFICATION:

Laboratory Unit:	Titration	Method Introduced:	01/04/74
Method Reference No:	E3289A	Units:	$\mu\text{S}/\text{cm}$ at 25°C
LIMS Product Code:	PHALCO3289,CONDPH3289	Supervisor:	F. Lo
Sample Type/Matrix:	Rivers, Lakes		

### SAMPLING:

Quantity Required:	25 mL
Container:	Glass or plastic

### ANALYTICAL PROCEDURE:

After equilibration at 25°C, the conductivity of the sample is measured.  
pH, Gran alkalinity and total fixed endpoint alkalinity are determined simultaneously.

### INSTRUMENTATION:

Automated modular continual flow conductivity system comprising of a sampler, water bath, pump, conductivity meter with cell plus microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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### CONTROLS:

Calibration:	BL plus 3 standards, e.g. QCA
Drift:	In run standards throughout the run (tap water diluted to 20% V/V)

# CONDUCTIVITY

QUALITY CONTROL DATA FROM 03/01/95 TO 27/12/95

Laboratory Unit: Titration

Analytical Range: to 2000  $\mu\text{S}/\text{cm}$

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	96	717.8	717.6	-0.2	1.1098
B:	96	147.0	147.6	0.6	0.7592
C:	96	147.0	147.6	0.6	0.7592
D:	96	37.1	37.2	0.1	0.3940
A+B:	96	864.8	865.2	0.4	1.4157
A-B:	96	570.8	570.1	-0.7	1.2696
C+D:	96	184.1	184.8	0.7	0.9025
C-D:	96	109.9	110.4	0.5	0.8054

s.d.(AB) S(between runs): 0.95

Sw(within run): 0.90

S/Sw: 1.1

s.d.(CD) S(between runs): 0.61

Sw(within run): 0.57

S/Sw: 1.1

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

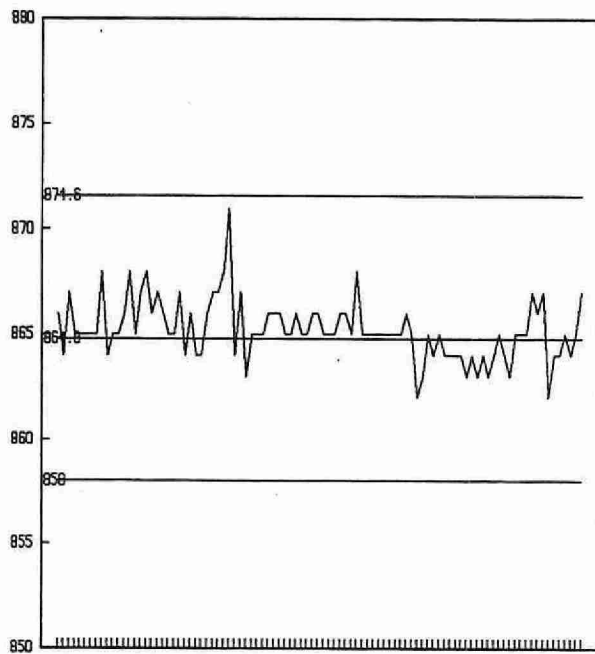
858	-	871.6	for	A+B
565.7	-	575.9	for	A-B
180.54	-	187.66	for	C+D
107.23	-	112.57	for	C-D

## DUPLICATES:

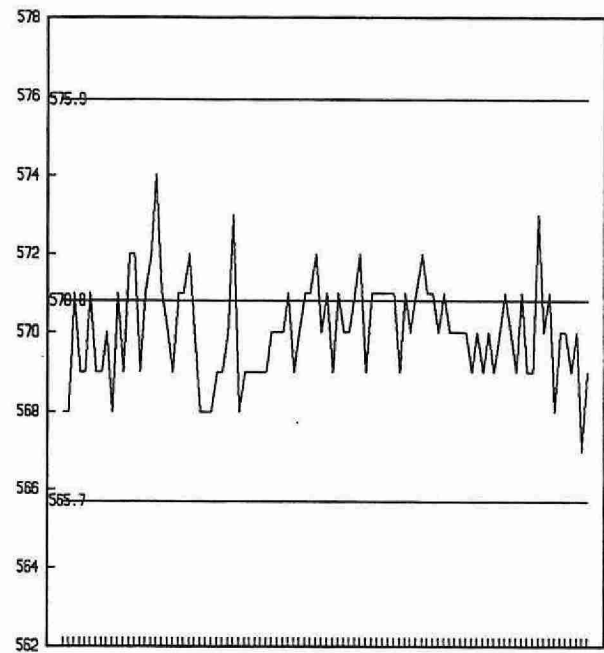
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
124	0 - 400	1.3511	0.6
123	401 - 1000	2.3269	0.4
21	1001 - 2000	6.7208	0.5
3	2001 - 10000	38.448	1.1
271	Overall	2.0495	

# CONDUCTIVITY ( $\mu\text{S}/\text{cm}$ )

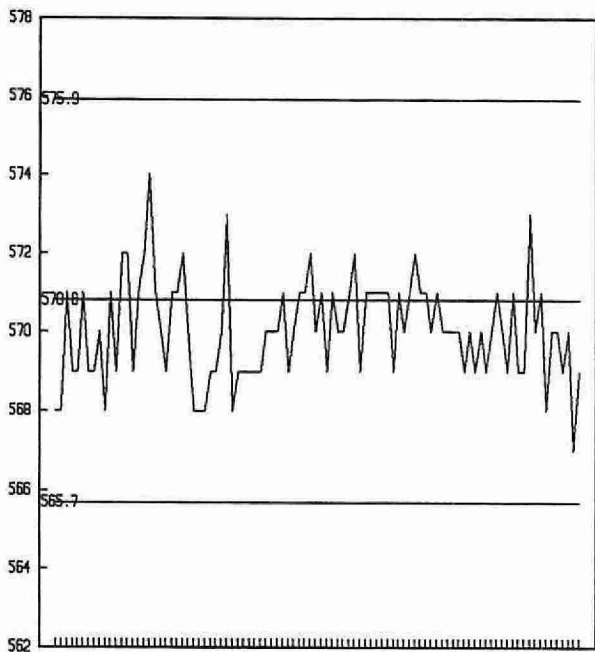
QUALITY CONTROL DATA FROM 03/01/95 TO 27/12/95



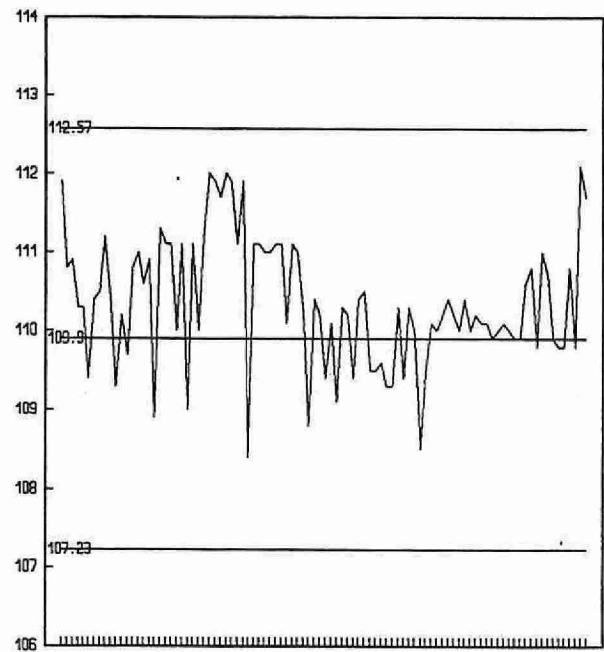
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

CONTROL LIMIT

## COPPER, TOTAL

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/01/91
Method Reference No.	E3376A	Units	µg/L as Cu
LIMS Product Code	METGF3376	Supervisor	J. McBride
Sample Type/Matrix	Surface waters, precipitation		

### SAMPLING:

Quantity Required	5 mL
Container	glass or plastic, capped, acidified to 0.25% with HNO <sub>3</sub>

### ANALYTICAL PROCEDURE:

Samples are analyzed by GFAAS at 324.8nm.  
Absorbance : 0.8 at full scale

### INSTRUMENTATION:

A graphite furnace atomic absorption spectrometer with automated sampler.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.003	Current T value: 0.015
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### CALIBRATION:

BL plus 4 standards

### CONTROLS:

Calibration	1 NRC, 1 QCA
Drift	1 blank plus 1 standard



# COPPER, TOTAL

QUALITY CONTROL DATA FROM 19/01/95 TO 19/12/95

Laboratory Unit: Dorset

Full Scale: to 10 µg/L as Cu

## CALIBRATION CONTROL:

	n	Mean Concentration	Standard Deviation (1)
QCA	44	0.5466	0.0292
NRC	43	2.7667	0.0648

## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
24	0.00 - 1.00	0.0508	14.6
0	1.01 - 2.00	N.A.	N.A.
0	2.01 - 5.00	N.A.	N.A.
0	5.01 - 10.0	N.A.	N.A.
24	Overall	0.0508	

## OTHER CHECKS:

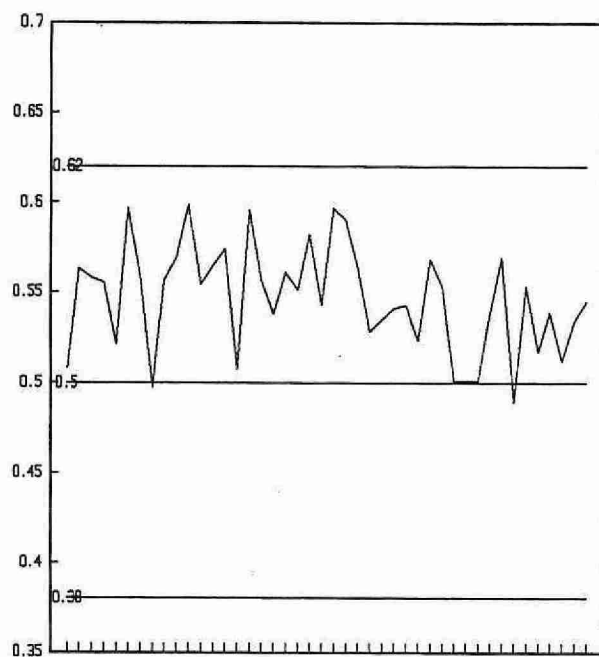
	n	Mean	Standard Deviation (1)
LTB	44	0.0302	0.0221

## NOTES:

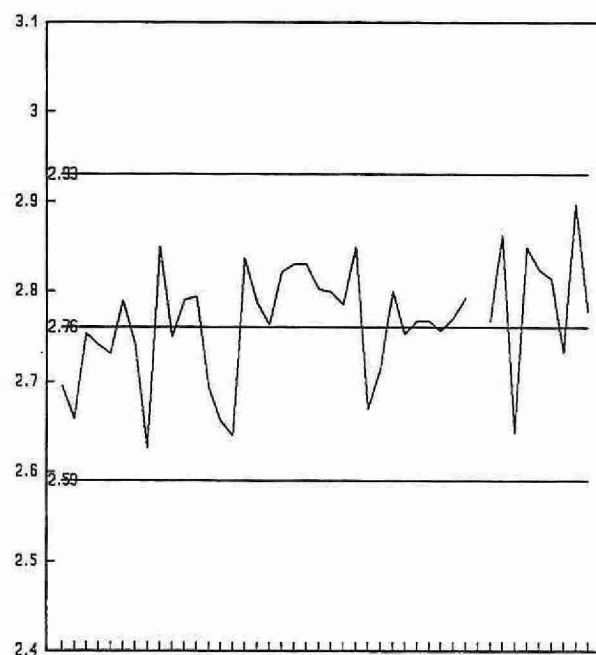
QCA is a low level calibration control standard prepared from an EPA ampoule.

COPPER, TOTAL ( $\mu\text{g/L}$ )

QUALITY CONTROL DATA FROM 19/01/95 TO 19/12/95



QUALITY CONTROL STANDARD A



NRC REFERENCE SAMPLE

\_\_\_\_\_ CONTROL LIMIT

## CYANIDE, FREE

### IDENTIFICATION:

Laboratory Unit:	Colourimetry	Method Introduced:	
Method Reference No:	E3014A	Units:	mg/L as CN <sup>-</sup>
LIMS Product Code:	CN3014	Supervisor:	J. McBride
Sample Type/Matrix:	Surface and drinking water, sewages and industrial wastes and in distillates from the manual distillation of samples for total cyanides.		

### SAMPLING:

Quantity Required:	350 mL
Container:	Glass or plastic

### ANALYTICAL PROCEDURE:

Prescreen is conducted on all samples requiring Total Cyanide. If results of the prescreen are less than 0.01 mg/L CN<sup>-</sup> no further processing is required, otherwise the size of sample taken is judged upon the prescreen result. Free cyanide, includes the free, simple and weakly bound complex cyanides that decompose at 106°C, at pH 4. Cyanide is determined colourimetrically by the reaction of cyanide with chloramine-T to form cyanogen chloride which reacts with a combination of barbituric acid and isonicotinic acid to form a highly coloured coupling product which is measured at 600 nm.

### INSTRUMENTATION:

Distillation bath at 106°C.

Basic automated modular continuous flow system with colourimetric measurement through a 5 cm light path at 600 nm.

Data capture, reduction, and processing via a multistage microcomputer system.

### REPORTING:

Maximum Significant Figures: 2 or the nearest W	Current W value: 0.001	Current T value: 0.005
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### CALIBRATION:

BL plus 1 standard

### CONTROLS:

Calibration:	2 standards, e.g. QCA
Drift:	Blank and check standards

# CYANIDE, FREE

QUALITY CONTROL DATA FROM 24/01/95 TO 29/12/95

Laboratory Unit: Colourimetry

Full Scale: to 0.2 mg/L as CN

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	108	0.15	0.1469	-0.0091	0.0045
B:	108	0.02	0.0196	-0.0004	0.0012
A+B:	108	0.17	0.1666	-0.0034	0.0051
A-B:	108	0.13	0.1272	-0.0028	0.0041

s.d.(AB)    S(between runs): 0.0033    Sw(within run): 0.003    S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

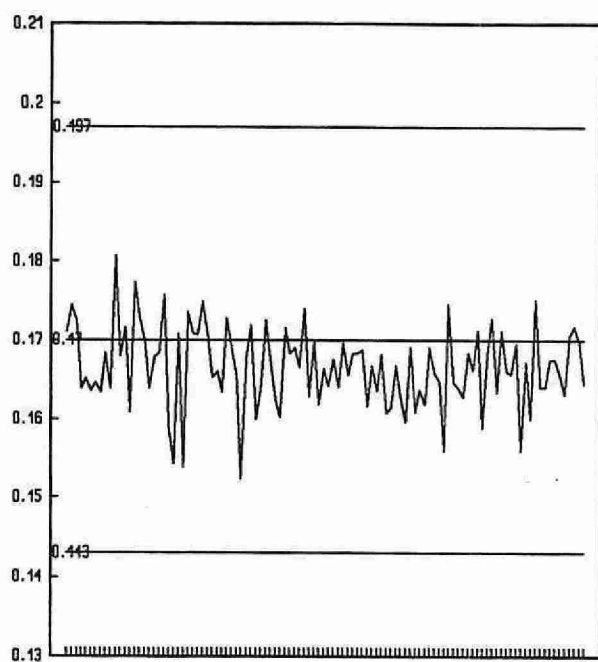
0.143 - 0.197 for A+B  
0.111 - 0.149 for A-B

## DUPLICATES:

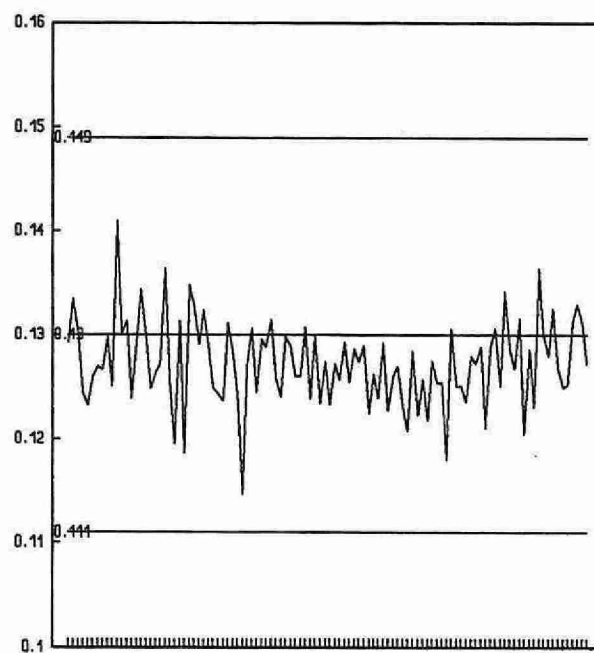
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
126	0 - 0.020	0.0002	9.7
1	0.021 - 0.040	N.A.	N.A.
2	0.041 - 0.100	N.A.	N.A.
1	0.101 - 0.200	N.A.	N.A.
130	Overall	0.0004	

CYANIDE, FREE (mg/L as CN)

QUALITY CONTROL DATA FROM 24/01/95 TO 29/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## CYANIDE, TOTAL

### IDENTIFICATION:

Laboratory Unit:	Colourimetry	Method Introduced:	
Method Reference No:	E3015A	Units:	mg/L as CN <sup>-</sup>
LIMS Product Code:	CN3015	Supervisor:	J. McBride
Sample Type/Matrix:	Surface and drinking water, sewage, landfill leachates, and industrial wastes.		

### SAMPLING:

Quantity Required:	350 mL
Container:	Glass or plastic

### ANALYTICAL PROCEDURE:

Prescreen is conducted on all samples requiring Total Cyanide through the automated distillation procedure. Total Cyanides, including free, simple and complex cyanides are distilled out of a tartaric acid reflux/distillation as HCN and trapped in an alkaline solution. Cyanide is determined colourimetrically by the reaction of cyanide with chloramine-T to form cyanogen chloride which reacts with a combination of barbituric acid and isonicotinic acid to form a highly coloured coupling product which is measured at 600 nm.

### INSTRUMENTATION:

Distillation bath.

Basic automated modular continuous flow system with colourimetric measurement through a 5 cm light path at 600 nm.

Data capture, reduction, and processing via a multistage microcomputer system.

### REPORTING:

Maximum Significant Figures: 2 or the nearest W	Current W value: 0.001	Current T value: 0.005
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### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration:	2 standards, e.g. QCA
Drift:	BL and check standards

# CYANIDE, TOTAL

QUALITY CONTROL DATA FROM 24/01/95 TO 29/12/95

Laboratory Unit: Colourimetry

Full Scale: to 0.2 mg/L as CN

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	108	0.15	0.1471	-0.0029	0.0044
B:	108	0.02	0.0195	-0.0005	0.0010
A+B:	108	0.17	0.1666	-0.0034	0.0049
A-B:	108	0.13	0.1276	-0.0024	0.0042

s.d.(AB)

S(between runs): 0.0032

Sw(within run): 0.003

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

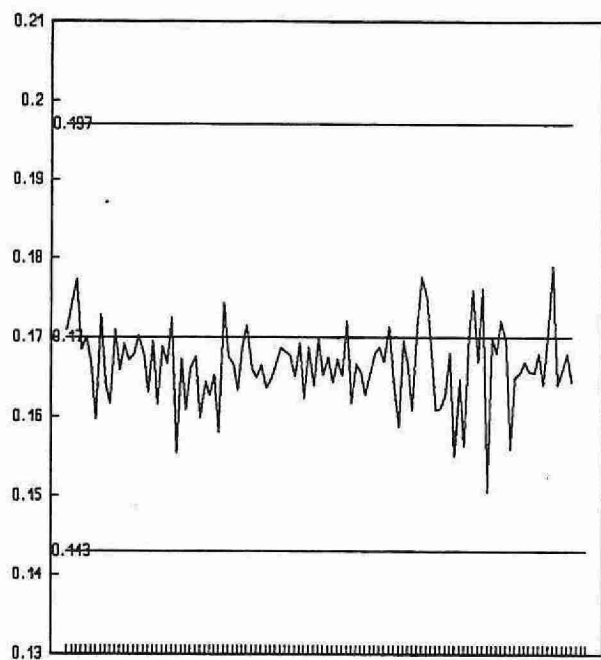
0.143 - 0.197 for A+B  
0.111 - 0.149 for A-B

## DUPLICATES:

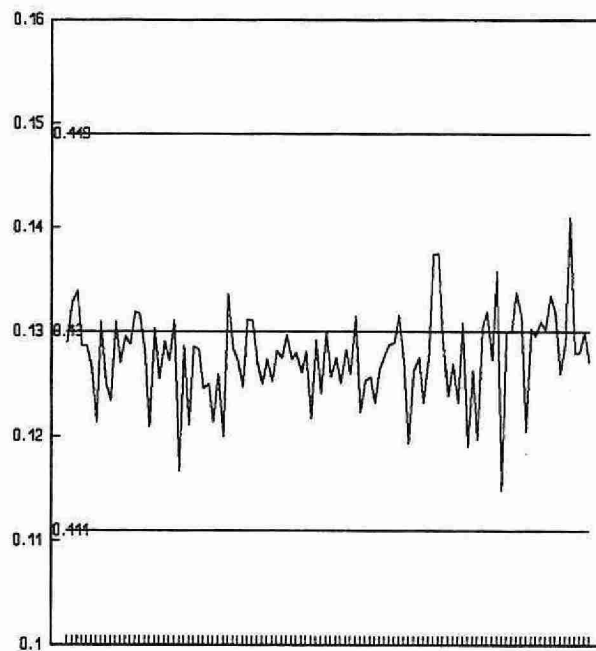
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
113	0 - 0.020	0.00042	24.7
0	0.021 - 0.040	N.A.	N.A.
1	0.041 - 0.100	N.A.	N.A.
0	0.101 - 0.200	N.A.	N.A.
114	Overall	0.00044	

CYANIDE, TOTAL (mg/L as CN)

QUALITY CONTROL DATA FROM 24/01/95 TO 29/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT



## FLUORIDE

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/06/80
Method Reference No.	E3041A	Units	µg/L as F
Lims Product Code	F3041	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Lakes, and Streams		

### SAMPLING:

Quantity Required	50 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Fluoride is determined by specific ion electrode using an automated flow system. Prior to measurement the sample is mixed with a high ionic strength buffer containing; sodium citrate, disodium ethylenediaminetetraacetate (EDTA), phosphoric acid, and sufficient sodium hydroxide to obtain pH 6.7.

### INSTRUMENTATION:

Automated modular continuous flow ion specific electrode system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	2 standards, e.g. QCA
Drift	BL plus 1 standard in duplicate
Interference	Combined fluoride and aluminum standard confirms that aluminum is not an interference.

# FLUORIDE

QUALITY CONTROL DATA FROM 10/01/95 TO 22/12/95

Laboratory Unit: Dorset

Full Scale: to 70.0 µg/L as F

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	24	48	48.77	0.77	0.8835
B:	24	24	24.2	0.20	0.8372
A+B:	24	72	72.56	0.56	1.3925
A-B:	24	24	24.57	0.57	1.2132

s.d.(AB)    S(between runs): 0.86    Sw(within run): 0.86    S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

68.5    -    75.5    for    A+B  
21.5    -    26.5    for    A-B

## DUPLICATES:

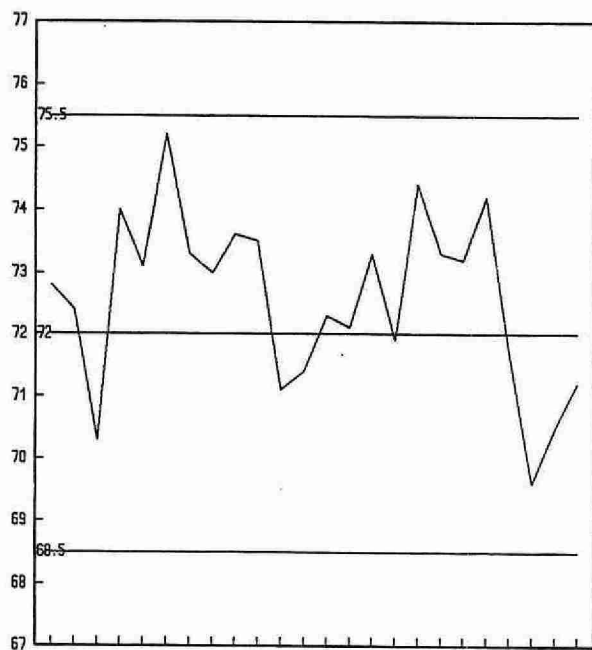
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
11	0.00 - 7.0	0.3323	7.5
1	7.10 - 14.0	N.A.	N.A.
18	14.1 - 35.0	0.8059	2.7
42	35.1 - 70.00	0.9336	1.9
72	Overall	0.8174	

## OTHER CHECKS:

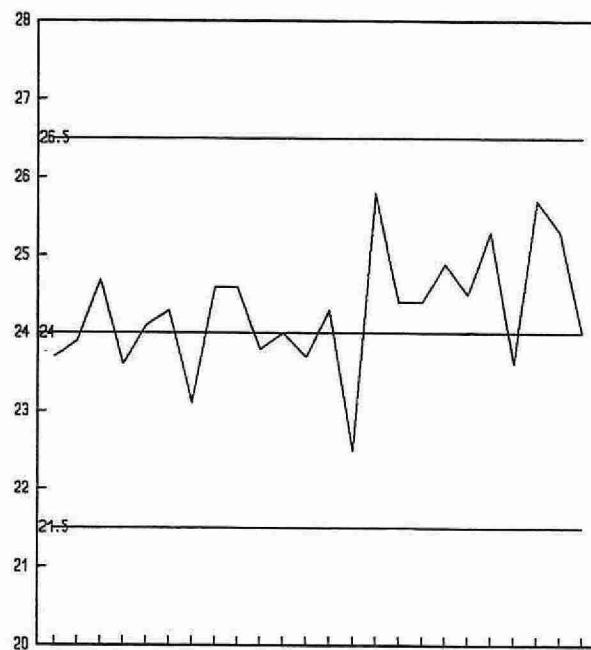
	n	Mean	Standard Deviation (1)
Al Interference	24	59.79	1.0587

FLUORIDE ( $\mu\text{g/L}$  as F)

QUALITY CONTROL DATA FROM 10/01/95 TO 22/12/95



QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B

CONTROL LIMIT

## FLUORIDE

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	before '74
Method Reference No	E3369A	Units	mg/L as F
LIMS Product Code	FNOT3369	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Surface Waters, Leachates, Effluents		

### SAMPLING:

Quantity Required	50 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Using an automated flow system the sample is distilled in the presence of sulphuric acid at 160°C; the distillate is then reacted (in an acetic acid-acetate buffer media) with Alizarin Fluorine Blue and lanthanum nitrate to form a ternary Alizarin Blue-lanthanide-fluoride complex.  
Approximate absorbance: 0.8 at the full scale level.

### INSTRUMENTATION:

Modular continuous flow colourimetric system plus a distillation module. Colourimetric measurement is through a 5.0 cm. light path at 630 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
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### CALIBRATION:

BL plus 6 standards

### CONTROLS:

Calibration	LTB plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

# FLUORIDE

QUALITY CONTROL DATA FROM 04/01/95 TO 15/12/95

Laboratory Unit: Colourimetry

Analytical Range: to 2.0 mg/L as F

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	71	1.6	1.603	0.003	0.0168
B:	71	0.8	0.796	-0.004	0.0133
C:	71	0.16	0.162	0.002	0.0093
A+B:	71	2.4	2.400	0.000	0.0234
A-B:	71	0.8	0.807	0.007	0.0194
B+C:	71	0.96	0.959	-0.001	0.0170
B-C:	71	0.64	0.634	-0.006	0.0154

s.d.(AB) S(between runs): 0.015 Sw(within run): 0.014 S/Sw: 1.1

s.d.(BC) S(between runs): 0.011 Sw(within run): 0.011 S/Sw: 1.0

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

2.302	-	2.498	for	A+B
0.726	-	0.874	for	A-B
0.91	-	1.01	for	B+C
0.59	-	0.69	for	B-C

## DUPLICATES:

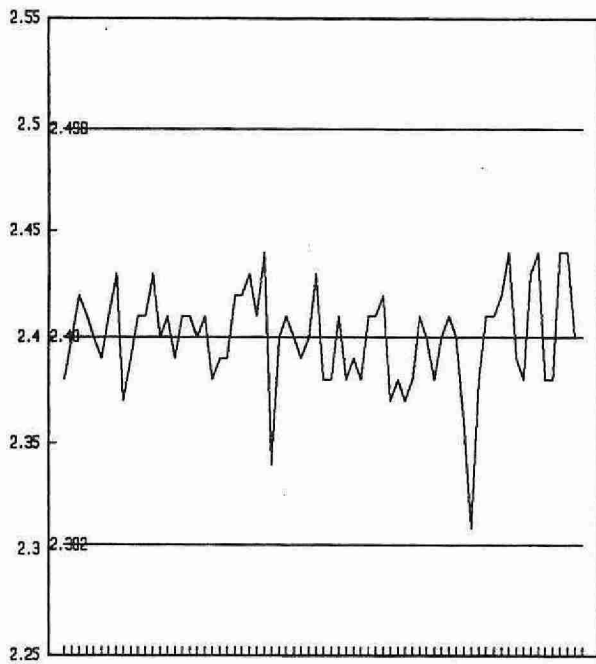
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
144	0.00 - 0.20	0.0089	9.3
14	0.21 - 0.40	0.0135	4.5
35	0.41 - 1.00	0.0201	2.5
16	1.01 - 2.00	0.0256	2.0
209	Overall	0.0120	

## OTHER CHECKS:

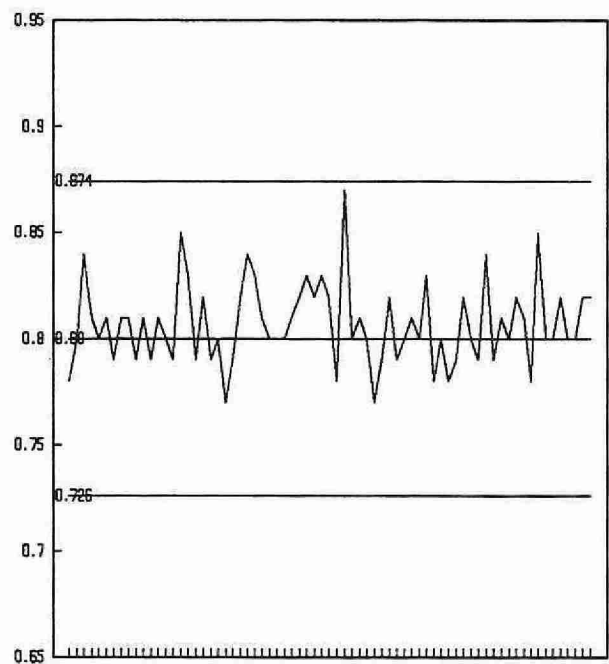
	n	Data Mean	Standard (1) Deviation
Long Term Blank	71	0.0020	0.0097

# FLUORIDE (mg/L as F)

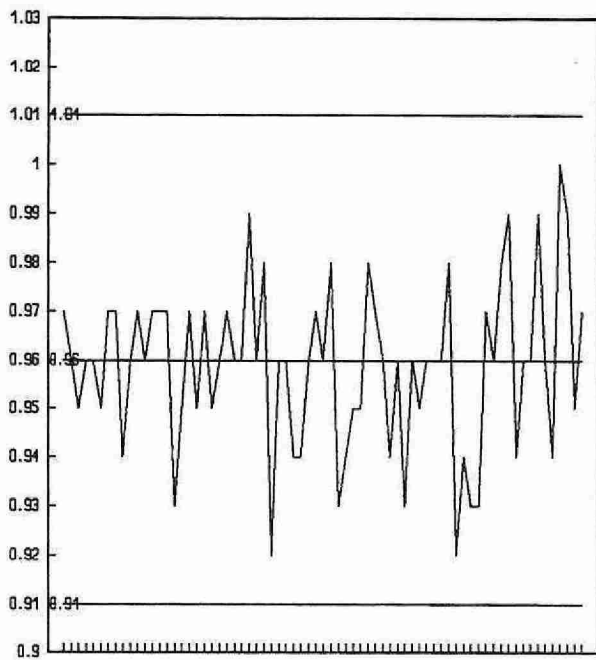
QUALITY CONTROL DATA FROM 04/01/95 TO 15/12/95



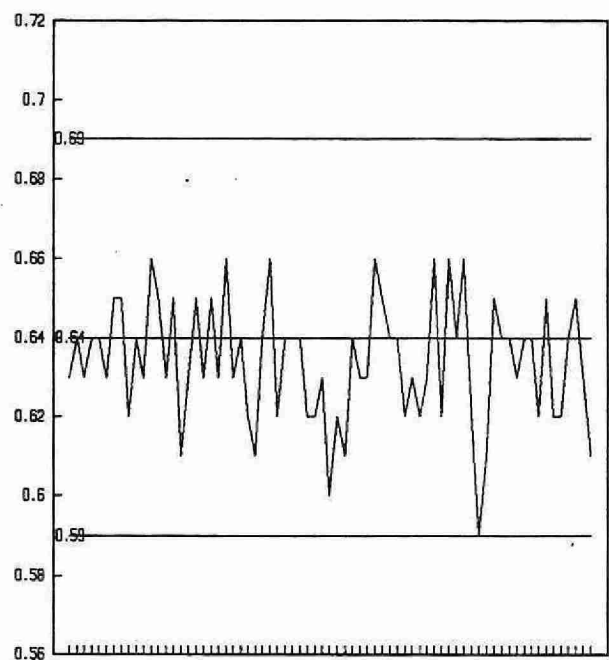
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

CONTROL LIMIT

## HARDNESS

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	01/04/74
Method Reference No.	E3171A	Units	mg/L as CaCO <sub>3</sub>
LIMS Product Code	CAT3171,HARD3171	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Soil Extracts		

### SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are analysed for calcium and magnesium by AAS (E3171A). Hardness is calculated using the formula:

$$HARDT = (CAUR \times 2.497) + (MGUR \times 4.118)$$

### INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

Refer to Calcium and Magnesium tests (E3171A)

### CONTROLS:

Refer to Calcium and Magnesium tests (E3171A)

## HARDNESS

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	08/04/86
Method Reference No.	E3217A	Units	mg/L as CaCO <sub>3</sub>
LIMS Product Code	CAT3217,CATS3217,HARD3217	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents, Sewage,Industrial Wastes		

### SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are analysed for calcium and magnesium by AAS (E3217A). Hardness is calculated using the formula:

$$HARDT = (CAUR \times 2.497) + (MGUR \times 4.118)$$

### INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
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### CALIBRATION:

Refer to Calcium and Magnesium tests (E3217A)

### CONTROLS:

Refer to Calcium and Magnesium tests (E3217A)



## HARDNESS

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Units	mg/L as CaCO <sub>3</sub>
LIMS Product Code	CAT3249	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes		

### SAMPLING:

Quantity Required	5 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Samples are analysed for calcium and magnesium by AAS (E3249A). Hardness is calculated using the formula:

$$HARDT = (CAUR \times 2.497) + (MGUR \times 4.118)$$

### INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

Refer to Calcium and Magnesium tests (E3249A)

### CONTROLS:

Refer to Calcium and Magnesium tests (E3249A)

## IRON, TOTAL

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3303B	Units	µg/L as Fe
LIMS Product Code	FEMN3303, FE3303	Supervisor	J. McBride
Sample Type/Matrix	Surface water, precipitation, soil leachates		

### SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic, capped, acidified to 0.25% with HNO <sub>3</sub>

### ANALYTICAL PROCEDURE:

An undigested sample is introduced to an in-line UV digester. A reducing agent and a buffer are added to the sample. TPTZ is added to develop a blue colour, the intensity of which is proportional to the concentration of Fe in the sample. The colour is measured at 600nm.

### INSTRUMENTATION:

- An AAII autoanalyzer with colorimeter and automated sampler.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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### CALIBRATION:

BL plus 4 standards

### CONTROLS:

Calibration	Long Term blank, 3 QC's, 4 duplicates
Drift	Blank plus 1 standard every 10 samples.

# IRON, TOTAL

QUALITY CONTROL DATA FROM 05/01/95 TO 21/12/95

Laboratory Unit: Dorset

Full Scale: to 1000.0 µg/L as Fe

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	39	750.0	751.13	1.13	5.9213
B:	39	250.0	247.97	-2.03	3.1076
C:	39	50.0	48.43	-1.57	2.3373
A+B:	39	1000.0	1000.5	0.5	5.9021
A-B:	39	500.0	503.15	3.15	7.2349
B+C:	39	300.0	297.79	-2.21	3.7499
B-C:	39	200.0	199.49	-0.51	3.4095

s.d.(AB) S(between runs): 4.73

Sw(within run): 5.12

S/Sw: 0.92

s.d.(BC) S(between runs): 2.69

Sw(within run): 2.41

S/Sw: 1.11

The calibration is accepted if the calibration control values obtained lie within the ranges:

975	-	1025	for	A+B
520	-	480	for	A-B
285	-	315	for	B+C
190	-	210	for	B-C

## DUPLICATES:

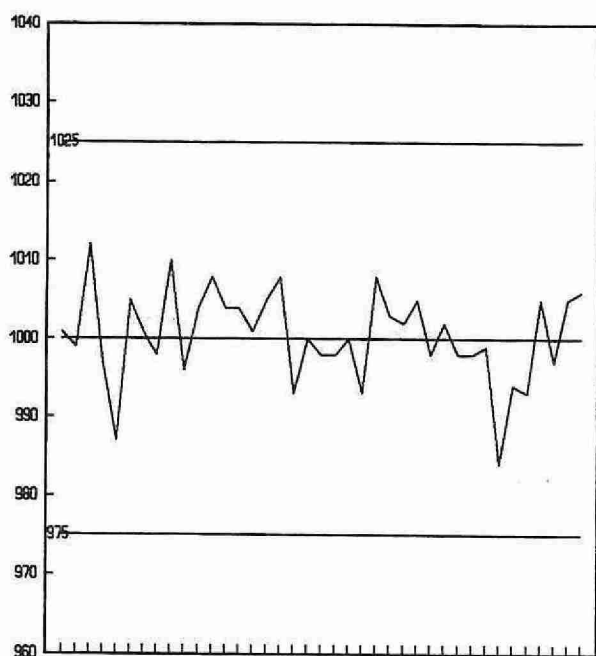
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
57	0 - 100	2.0427	6.9
23	101 - 200	2.6218	1.9
25	201 - 500	3.6398	1.2
8	501 - 1000	5.1954	0.7
113	Overall	2.8480	

## OTHER CHECKS:

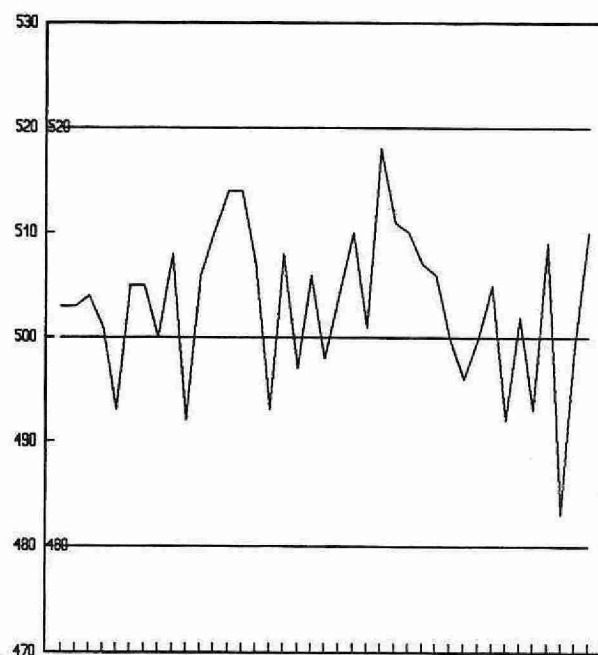
	n	Mean	Standard Deviation (1)
Long Term Blank	39	-0.6923	1.1732

IRON, TOTAL ( $\mu\text{g/L}$  as Fe)

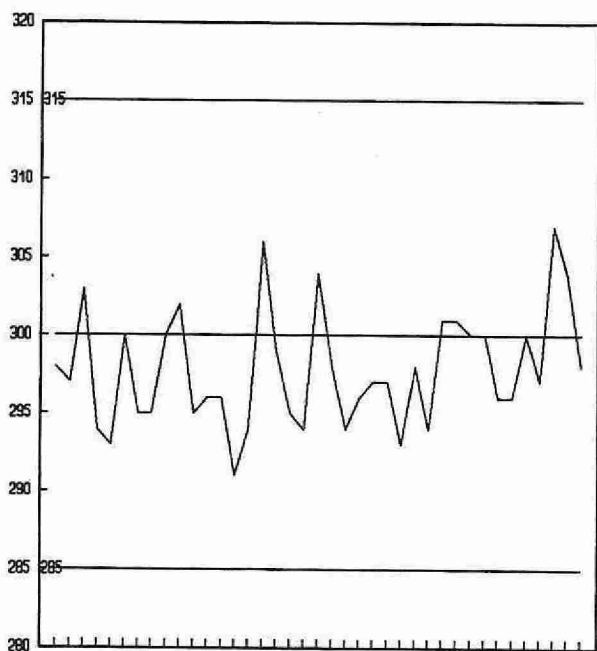
QUALITY CONTROL DATA FROM 05/01/95 TO 21/12/95



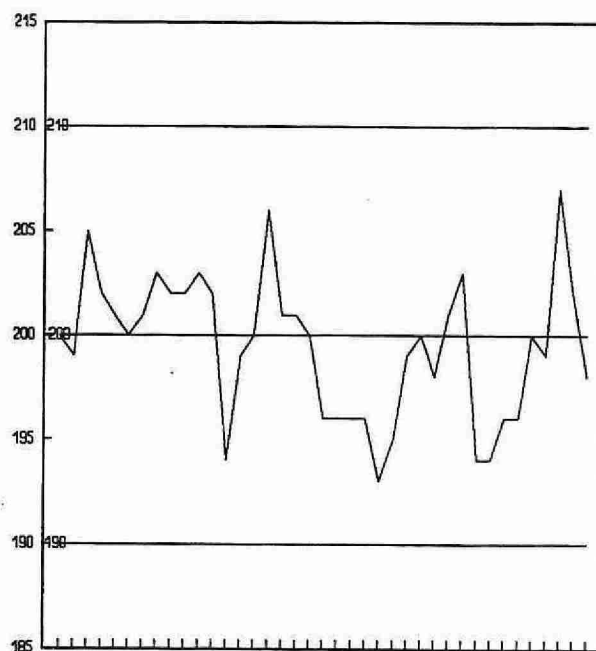
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## LEAD, TOTAL

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/01/91
Method Reference No.	E3376A	Units	µg/L as Pb
LIMS Product Code	METGF3376	Supervisor	J. McBride
Sample Type/Matrix	Surface waters, precipitation		

### SAMPLING:

Quantity Required	5 mL
Container	Glass or plastic, capped, acidified to 0.25% with HNO <sub>3</sub>

### ANALYTICAL PROCEDURE:

Samples are analyzed by GFAAS at 217nm.  
Absorbance : 0.35 at full scale

### INSTRUMENTATION:

A graphite furnace atomic absorption spectrometer with automated sampler.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.003	Current T value: 0.015
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### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration	1 NRC solution, 1 QCA
Drift	1 blank plus 1 standard

## LEAD, TOTAL

QUALITY CONTROL DATA FROM 13/03/95 TO 11/10/95

Laboratory Unit: Dorset

Full Scale: to 10 µg/L as Pb

### CALIBRATION CONTROL:

	n	Mean Concentration	Standard Deviation (1)
QCA	18	0.5324	0.0273
NRC	18	0.1266	0.0055

### DUPLICATES:

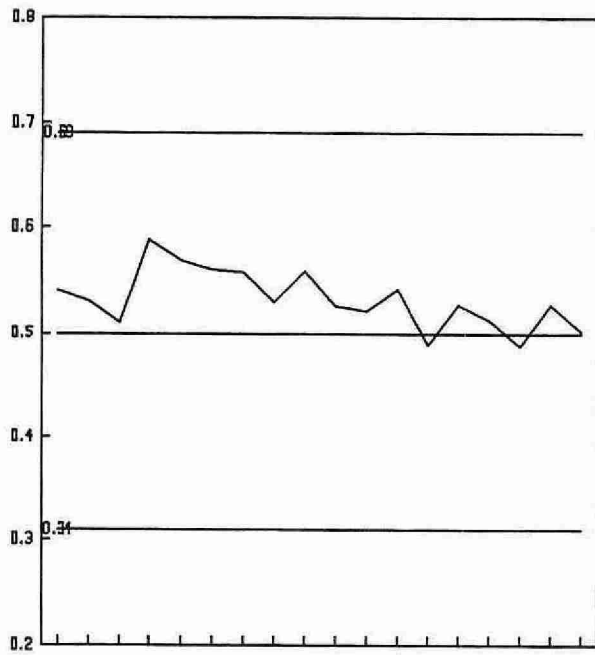
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
10	0.00 - 1.00	0.0078	46.4
3	1.01 - 2.00	0.0335	32.3
13	2.01 - 5.00	0.0586	28.2
12	5.01 - 10.0	0.0526	16.0
38	Overall	0.0370	

### NOTES:

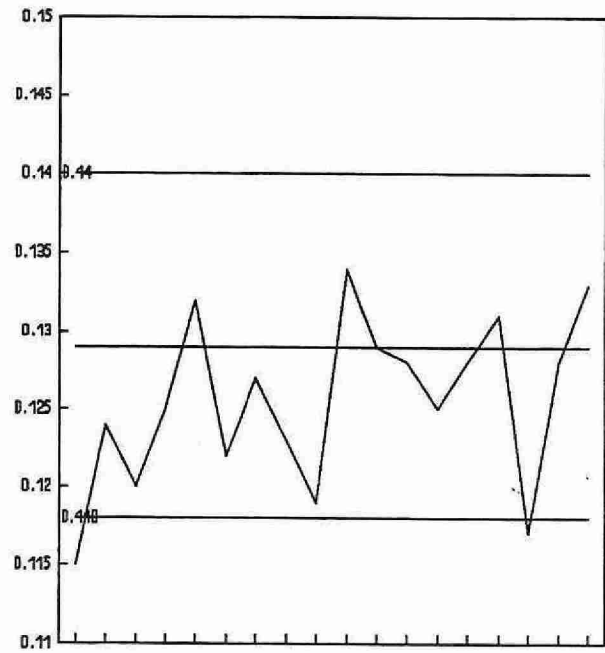
QCA is a low level calibration control standard prepared from an EPA ampoule.

LEAD, TOTAL ( $\mu\text{g/L}$ )

QUALITY CONTROL DATA FROM 13/01/95 TO 11/10/95



QUALITY CONTROL STANDARD A



NRC REFERENCE SAMPLE

CONTROL LIMIT

## MAGNESIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	18/05/79
Method Reference No.	E3146A	Units	mg/L as Mg
LIMS Product Code	CAT3146	Supervisor	J. McBride
Sample Type/Matrix	Precipitation		

### SAMPLING:

Quantity Required	5 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

### INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.001	Current T value: 0.005
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### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.



# MAGNESIUM

QUALITY CONTROL DATA FROM 05/01/95 TO 13/10/95

Laboratory Unit: Atomic Absorption

Full Scale: to 0.500 mg/L as Mg

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	19	0.30	0.3028	0.0028	0.0032
B:	19	0.05	0.0509	0.0009	0.0011
A+B:	19	0.35	0.3538	0.0038	0.0035
A-B:	19	0.25	0.2519	0.0019	0.0032

s.d.(AB)

S(between runs): 0.002

Sw(within run): 0.002

S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.338 - 0.362 for A+B  
0.241 - 0.259 for A-B

## DUPLICATES:

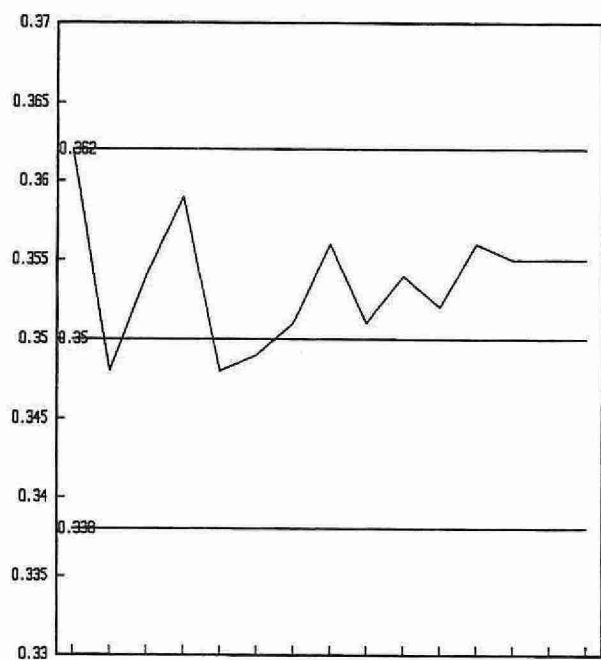
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
22	0.000 - 0.050	0.0007	3.1
6	0.051 - 0.100	0.0012	2.0
11	0.101 - 0.250	0.0013	0.7
7	0.250 - 0.500	0.0023	0.6
46	OVERALL	0.0011	

## OTHER CHECKS:

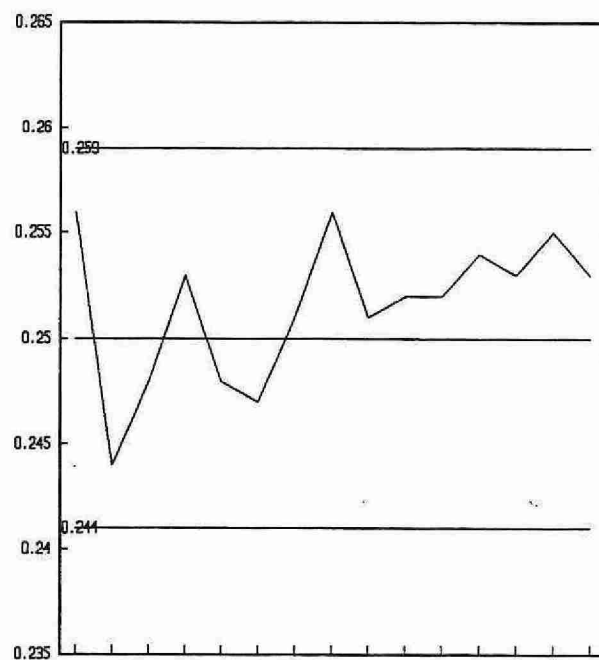
	n	Mean	Standard Deviation (1)
Long Term Blank	19	0.0005	0.0016

MAGNESIUM (mg/L as Mg)

QUALITY CONTROL DATA FROM 05/01/95 TO 13/10/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## MAGNESIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	01/04/74
Method Reference No.	E3171A	Units	mg/L as Mg
LIMS Product Code	CAT3171,MG3171,HARD3171	Supervisor	J. McBride
Sample Type/Matrix	Surface Waters, DWSP Drinking Waters		

### SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 1.19 at the full scale level.

### INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.10
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### CALIBRATION:

BL plus 11 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

# MAGNESIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/95

Laboratory Unit: Atomic Absorption

Full Scale: to 10.0 mg/L as Mg

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	125	8.00	8.08	0.08	0.0642
B:	125	2.00	2.04	0.04	0.0270
C:	125	0.50	0.507	0.007	0.0104
A+B:	125	10.0	10.12	0.12	0.0785
A-B:	125	6.00	6.04	0.04	0.0594
B+C:	125	2.50	2.55	0.05	0.0335
B-C:	125	1.50	1.53	0.03	0.0234

s.d.(AB) S(between runs): 0.046

Sw(within run): 0.054

S/Sw: 1.2

s.d.(BC) S(between runs): 0.023

Sw(within run): 0.018

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.66	-	10.34	for	A+B
5.75	-	6.25	for	A-B
2.38	-	2.62	for	B+C
1.41	-	1.59	for	B-C

## DUPLICATES:

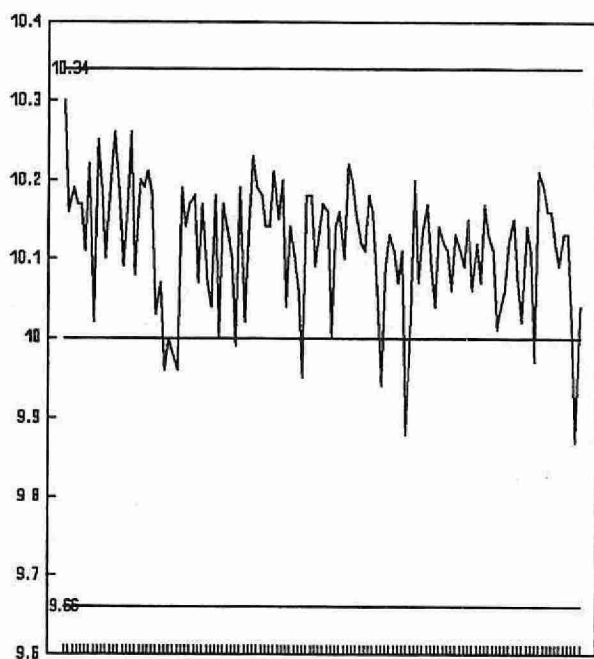
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
33	0.00 - 1.00	0.0118	3.9
37	1.01 - 2.00	0.0191	1.3
131	2.01 - 5.00	0.0328	1.6
81	5.01 - 10.0	0.0610	0.9
282	Overall	0.0373	

## OTHER CHECKS:

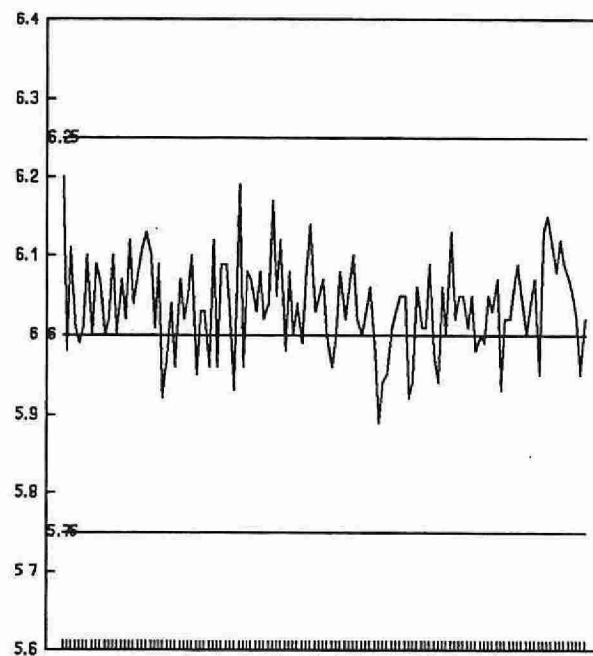
	n	Mean	Standard Deviation (1)
Long Term Blank	125	0.0001	0.0022

# MAGNESIUM (mg/L as Mg)

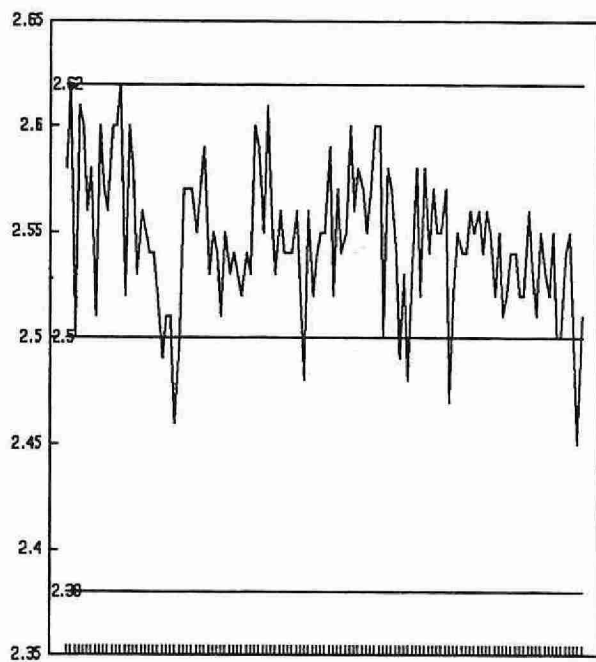
QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/95



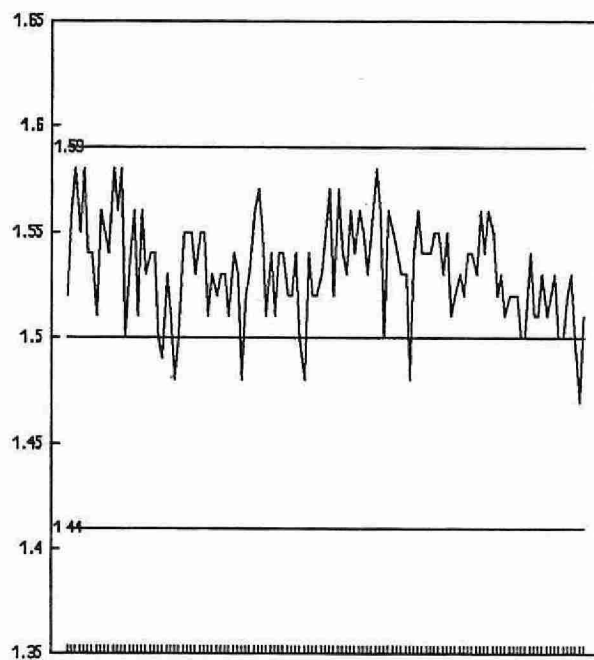
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## MAGNESIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	08/04/86
Method Reference No.	E3217A	Units	mg/L as Mg
LIMS Product Code	CAT3217,CATS3217,HARD3217	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents, Sewage, Industrial Wastes		

### SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.

Approximate absorbance: 1.87 at the full scale level.

### INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

BL plus 11 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

# MAGNESIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 22/12/95

Laboratory Unit: Absorption

Full Scale: to 50.00 mg/L as Mg

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	166	40.0	39.52	-0.48	0.4805
B:	166	10.0	9.88	-0.12	0.2341
C:	166	2.5	2.48	-0.02	0.0597
A+B:	166	50.0	49.40	-0.60	0.5964
A-B:	166	30.0	29.67	-0.33	0.6400
B+C:	166	12.5	12.36	-0.14	0.4235
B-C:	166	7.5	7.39	-0.11	0.2910

s.d.(AB) S(between runs): 0.38

Sw(within run): 0.30

S/Sw: 1.3

s.d.(BC) S(between runs): 0.17

Sw(within run): 0.13

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

47.80	-	52.20	for	A+B
28.50	-	31.50	for	A-B
11.45	-	13.55	for	B+C
6.80	-	8.20	for	B-C

## DUPLICATES:

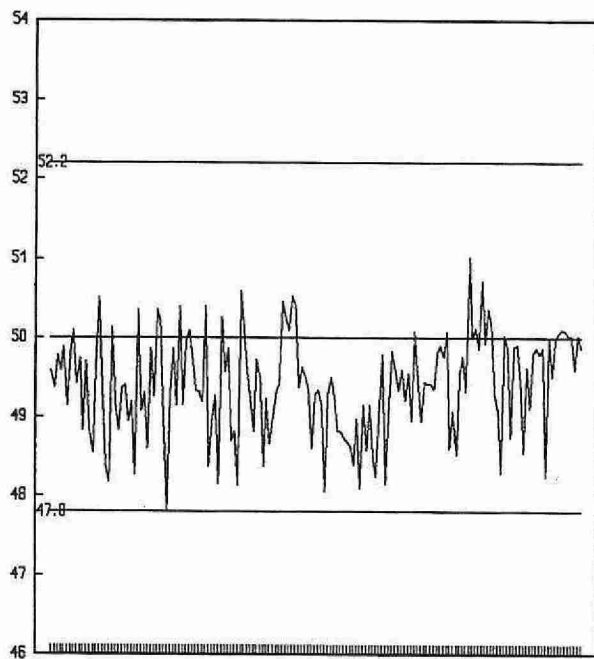
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
106	0.00 - 5.00	0.0440	4.0
129	5.01 - 10.00	0.0778	1.7
151	10.01 - 25.00	0.1616	1.1
88	25.01 - 50.00	0.2806	0.9
474	Overall	0.1259	

## OTHER CHECKS:

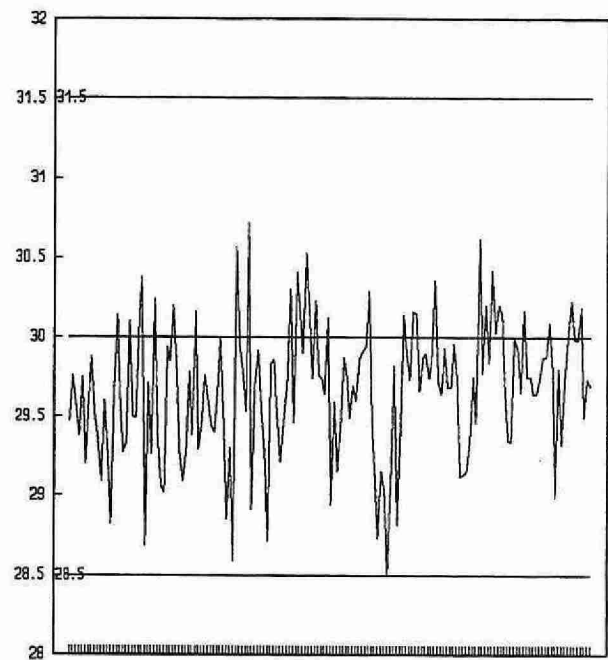
	n	Mean	Standard Deviation (1)
Long Term Blank	164	-0.0049	0.0264

MAGNESIUM (mg/L as Mg)

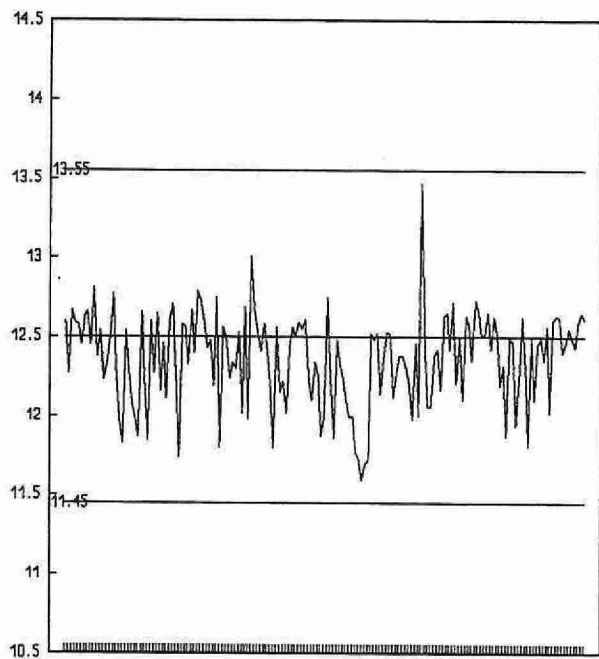
QUALITY CONTROL DATA FROM 03/01/95 TO 22/12/95



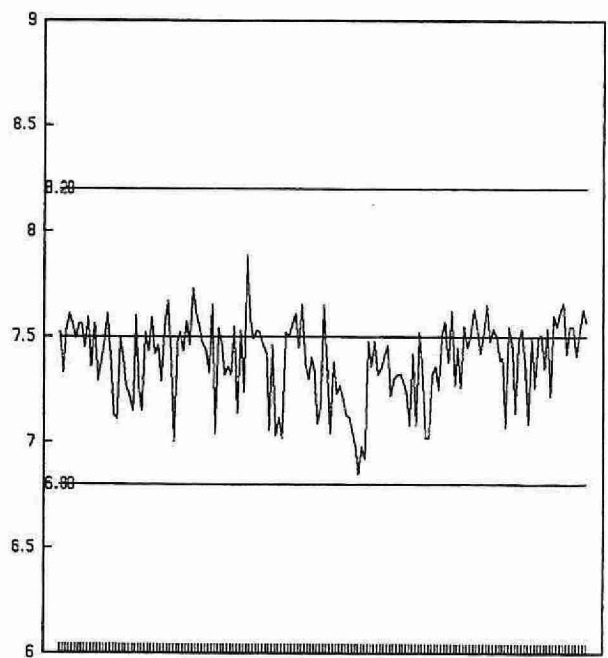
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT



## MAGNESIUM

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Units	mg/L as Mg
LIMS Product Code	CAT3249	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes,		

### SAMPLING:

Quantity Required	5 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 285.2 nm with an air-acetylene flame. Lanthanum chloride is added as a releasing agent via an automated sampling train.  
Approximate absorbance: 0.5 at the full scale level.

### INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

### NOTES:

The control standards are corrected for the LTB from which they were made.

# MAGNESIUM

QUALITY CONTROL DATA FROM 16/01/95 TO 18/12/95

Laboratory Unit: Dorset

Full Scale: to 2.0 mg/L as Mg

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	74	1.6	1.590	-0.010	0.0165
B:	74	0.4	0.399	-0.001	0.0066
C:	74	0.1	0.102	0.002	0.0020
A+B:	74	2.0	1.989	-0.011	0.0197
A-B:	74	1.2	1.191	-0.009	0.0151
B+C:	74	0.5	0.5001	0.0001	0.0068
B-C:	74	0.3	0.297	-0.003	0.0066

s.d.(AB) S(between runs): 0.013

Sw(within run): 0.010

S/Sw: 1.2

s.d.(BC) S(between runs): 0.005

Sw(within run): 0.005

S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.96	-	2.04	for	A+B
1.17	-	1.23	for	A-B
0.483	-	0.517	for	B+C
0.313	-	0.287	for	B-C

## DUPLICATES:

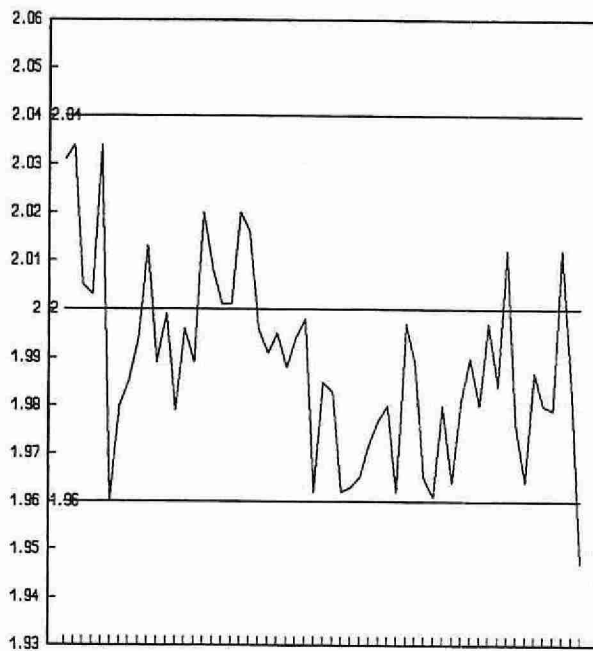
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
24	0.00 - 0.20	0.0015	3.3
15	0.21 - 0.40	0.0060	3.2
108	0.41 - 1.00	0.0090	2.1
8	1.01 - 2.00	0.0548	4.1
155	Overall	0.0079	

## OTHER CHECKS:

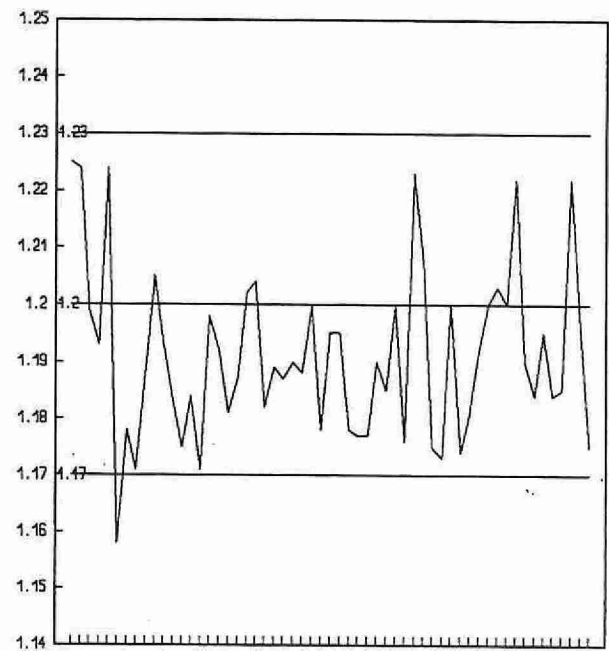
	n	Mean	Standard Deviation (1)
Long Term Blank	57	0.0002	0.0017

# MAGNESIUM (mg/L as Mg)

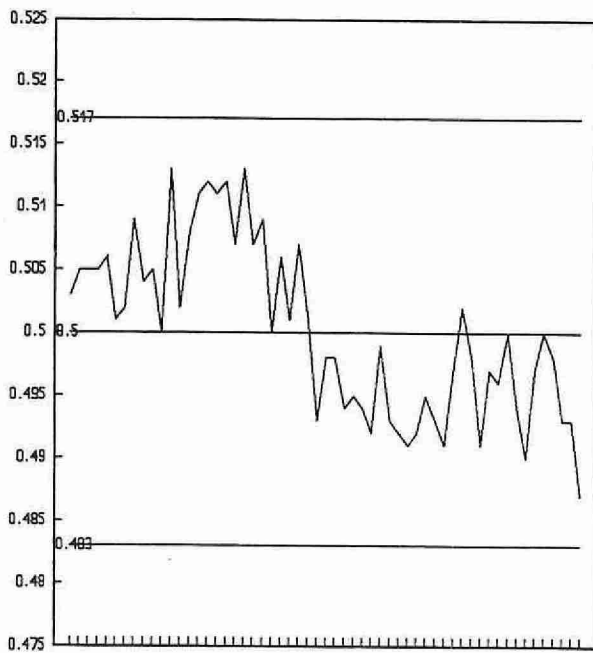
QUALITY CONTROL DATA FROM 16/01/95 TO 18/12/95



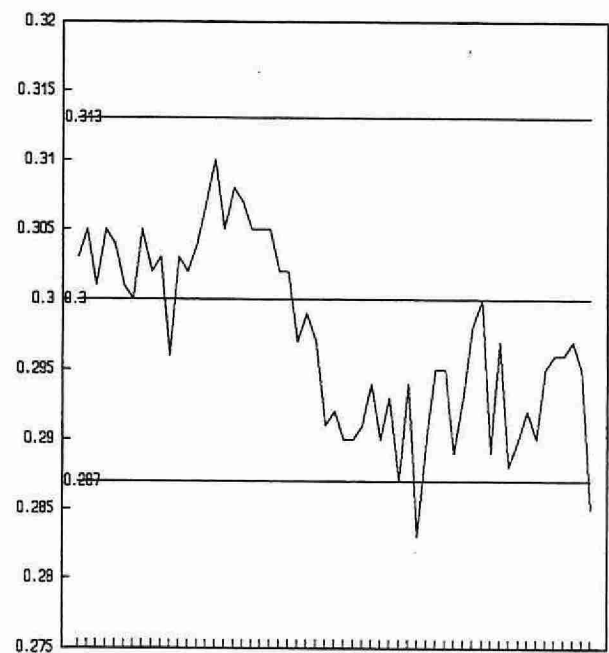
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## MANGANESE, TOTAL

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	1991
Method Reference No.LIS	E3303B	Units	µg/L as Mn
LIMS Product Code	FEMN3303	Supervisor	J. McBride
Sample Type/Matrix	Surface water, precipitation, soil leachates		

### SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic, capped, acidified to 0.25% with HNO <sub>3</sub>

### ANALYTICAL PROCEDURE:

An undigested sample is introduced to an in-line UV digester. A reducing agent and an ammonium buffer are added to the sample. Formaldoxime complexes with Mn to develop a colour the intensity of which is proportional to the concentration of Mn in the sample. EDTA is then added to complex interferences. The color is read at 480nm. A reference channel is used to counter the effects of residual natural colour in the sample. In the reference channel the EDTA is added prior to the addition of colour reagent.

### INSTRUMENTATION:

- An AAII autoanalyzer with colorimeter and automated sampler.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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### CALIBRATION:

BL plus 4 standards

### CONTROLS:

Calibration	Long Term blank, 3 QC's, 4 duplicates
Drift	Blank plus 1 standard every 10 samples.

# MANGANESE, TOTAL

QUALITY CONTROL DATA FROM 05/01/95 TO 21/12/95

Laboratory Unit: Dorset

Full Scale: to 200.0 µg/L as Mn

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	39	150.0	149.90	-0.10	1.6616
B:	39	50.0	49.53	-0.47	1.4612
C:	39	10.0	10.35	0.35	0.6390
A+B:	39	200.0	199.54	-0.46	2.6850
A-B:	39	100.0	100.37	0.37	1.5252
B+C:	39	60.0	59.98	-0.02	1.6998
B-C:	39	40.0	39.18	-0.82	1.4877

s.d.(AB) S(between runs): 1.56

Sw(within run): 1.08

S/Sw: 1.4

s.d.(BC) S(between runs): 1.13

Sw(within run): 1.05

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

193	-	207	for	A+B
95	-	105	for	A-B
55	-	65	for	B+C
36.5	-	43.5	for	B-C

## DUPLICATES:

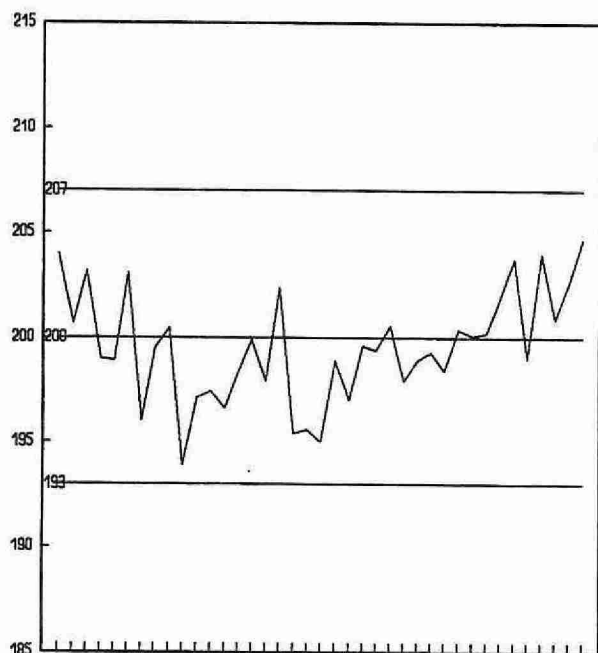
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
48	0.0 - 20.0	0.4368	5.8
29	20.1 - 40.0	1.0320	3.2
31	40.1 - 100.0	1.0090	1.6
8	100.1 - 200.0	1.7559	1.2
116	Overall	0.8585	

## OTHER CHECKS:

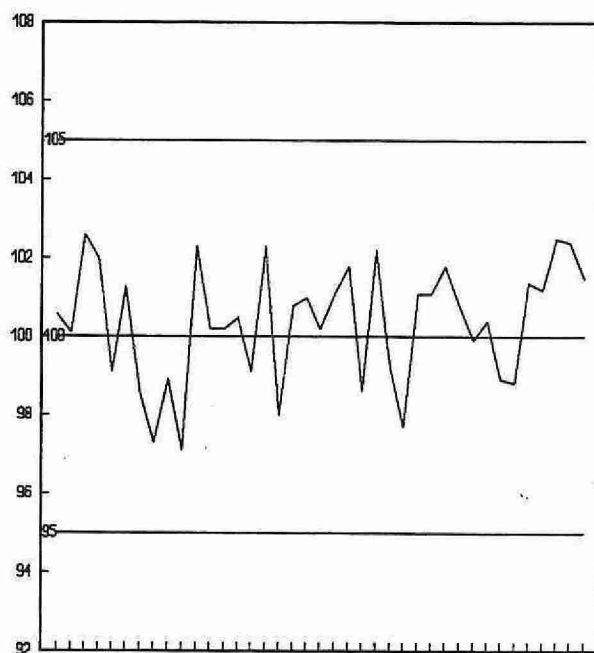
	n	Mean	Standard Deviation (1)
Long Term Blank	39	-0.0538	0.1745

# MANGANESE, TOTAL ( $\mu\text{g/L}$ as Mn)

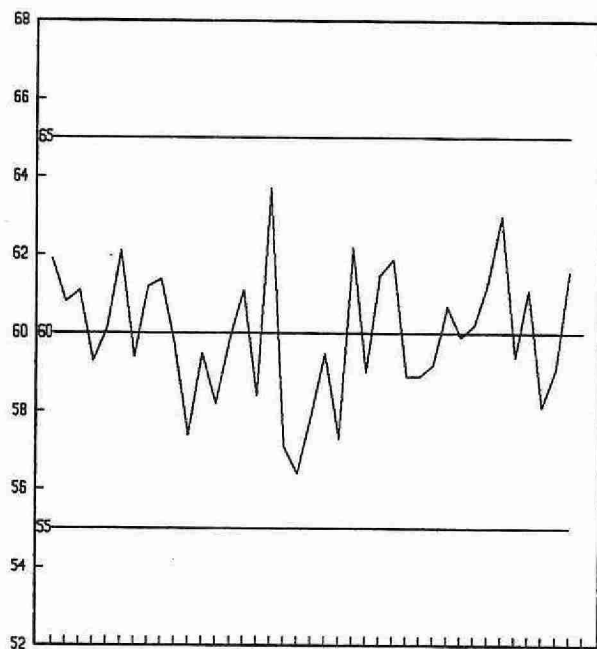
QUALITY CONTROL DATA FROM 05/01/95 TO 21/12/95



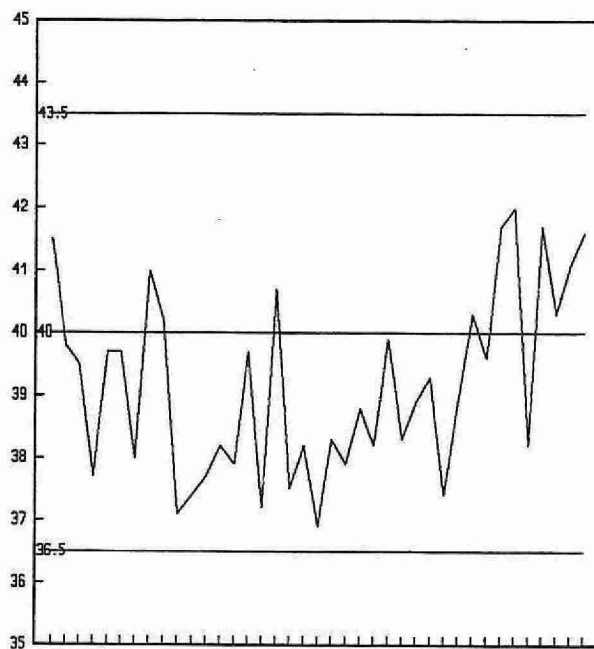
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## NITROGEN, AMMONIA PLUS AMMONIUM

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/05/84
Method Reference No	E3149A	Units	mg/L as N
LIMS Product Code	AMM3149	Supervisor	J.McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the supernatant of a settled sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects. Ammonia plus ammonium for dry deposition air filter extracts is also determined using this method.

Approximate absorbance: 0.7 at the full scale level.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37°C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5cm light path at 630 nm. Data capture, reduction and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.002	Current T value: 0.01
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

### NOTES:

Filter Extracts: Ammonia plus ammonium ions are determined on an extract from a dry deposition air filter. The analytical values are multiplied by 25 and reported as µg/filter as N. QC data outlined for this method may be applied to these results by multiplying the QC data by 25.

# NITROGEN, AMMONIA PLUS AMMONIUM

QUALITY CONTROL DATA FROM 11/01/95 TO 04/12/95

Laboratory Unit: Colourimetry

Full Scale: to 2.00 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation(1))
A:	28	1.600	1.596	-0.004	0.0088
B:	28	0.800	0.798	-0.002	0.0056
C:	28	0.160	0.165	0.005	0.0061
A+B:	28	2.400	2.394	-0.006	0.0110
A-B:	28	0.800	0.798	-0.002	0.0098
B+C:	28	0.960	0.964	0.004	0.0100
B-C:	28	0.640	0.633	-0.007	0.0061

s.d.(AB) S(between runs): 0.0073

Sw(within run): 0.0069

S/Sw: 1.1

s.d.(BC) S(between runs): 0.0058

Sw(within run): 0.0043

S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.34	-	2.46	for	A+B
0.75	-	0.85	for	A-B
0.927	-	0.993	for	B+C
0.616	-	0.664	for	B-C

## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
31	0.000 - 0.200	0.0035	5.1
23	0.201 - 0.400	0.0025	0.9
20	0.401 - 1.000	0.0057	2.1
6	1.001 - 2.000	0.0071	0.5
80	Overall	0.0040	

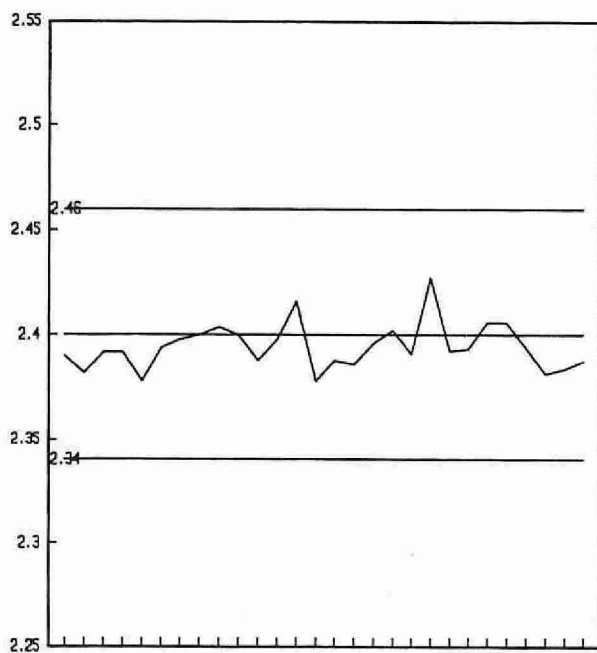
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	28	-0.0002	0.0063

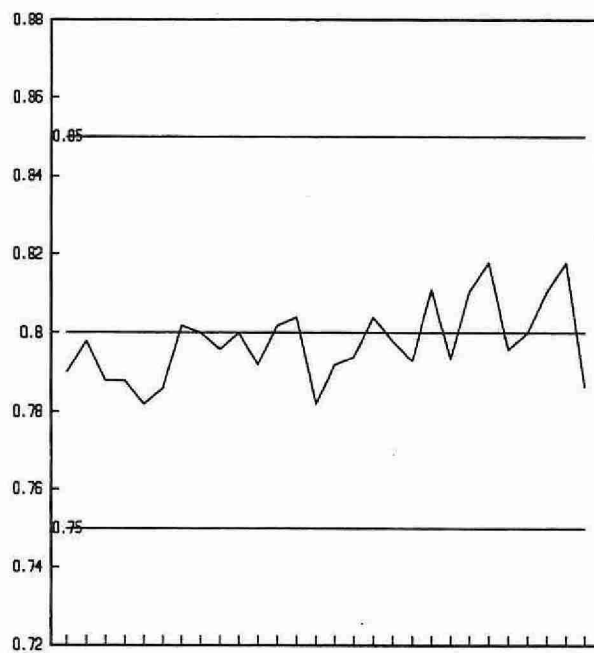


# NITROGEN, AMMONIA PLUS AMMONIUM (mg/L as N)

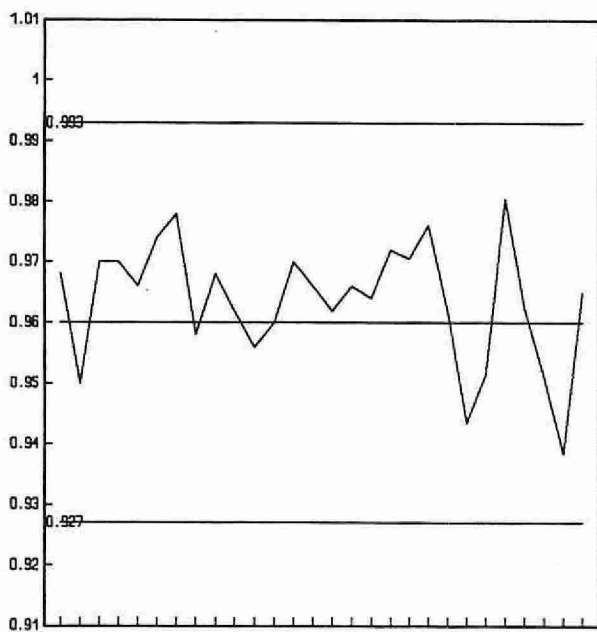
QUALITY CONTROL DATA FROM 11/01/95 TO 04/12/95



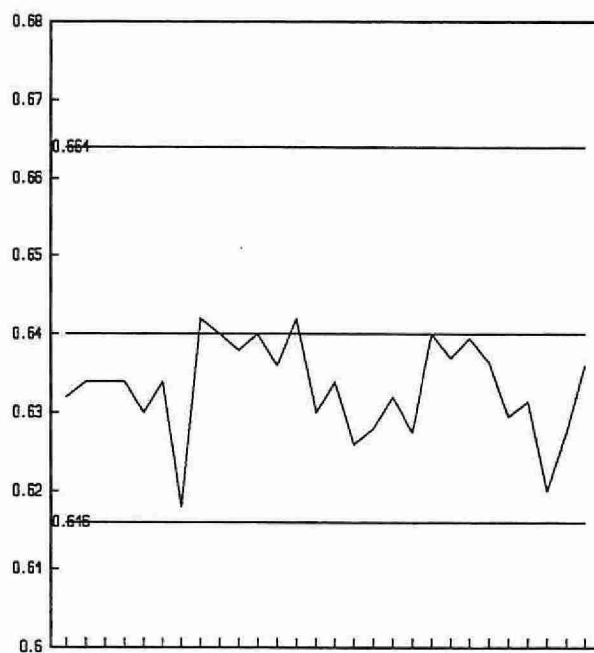
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## NITROGEN, AMMONIA PLUS AMMONIUM

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No	E3364A	Units	mg/L as N
LIMS Product Code	DISNUT3364	Supervisor	M. Rawlings
Sample Type/Matrix	Rivers, Lakes, Soil Extracts, Effluents		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the supernatant of a settled sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects.

Approximate absorbance: 0.5 at the full scale level.

Nitrate plus nitrite, nitrite, and reactive orthophosphate are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37°C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm. light path at 630 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.002	Current T value: 0.01
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

### NOTES:

Sept.'94 the method codes RNDNP-E3174A, E3175A, E3208A and E3266 were amalgamated and a new method code RNDNP-E3364A was generated.

# NITROGEN, AMMONIA PLUS AMMONIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 13/12/95

Laboratory Unit: Colourimetry

Full Scale: to 2.00 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	90	1.60	1.594	-0.006	0.0113
B:	90	0.800	0.797	-0.003	0.0068
C:	90	0.160	0.162	0.002	0.0052
A+B:	90	2.40	2.39	-0.01	0.0142
A-B:	90	0.800	0.796	-0.004	0.0120
B+C:	90	0.960	0.959	-0.001	0.0098
B-C:	90	0.640	0.636	-0.004	0.0070

s.d.(AB) S(between runs): 0.0093

Sw(within run): 0.0085

S/Sw: 1.1

s.d.(BC) S(between runs): 0.0060

Sw(within run): 0.0050

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.353	-	2.447	for	A+B
0.765	-	0.835	for	A-B
0.931	-	0.989	for	B+C
0.618	-	0.662	for	B-C

## DUPLICATES:

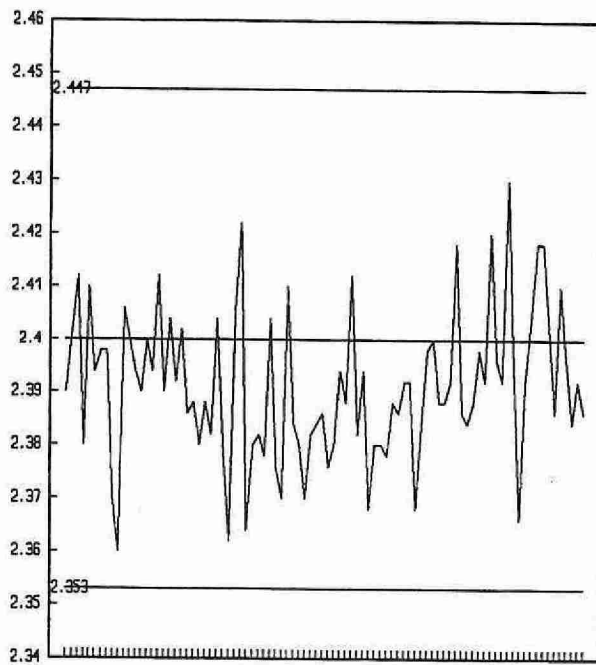
yn Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
250	0.000 - 0.200	0.0090	36.0
10	0.201 - 0.400	0.0265	8.8
8	0.401 - 1.00	0.0952	21.0
2	1.01 - 2.00	N.A.	N.A.
270	Overall	0.0102	

## OTHER CHECKS:

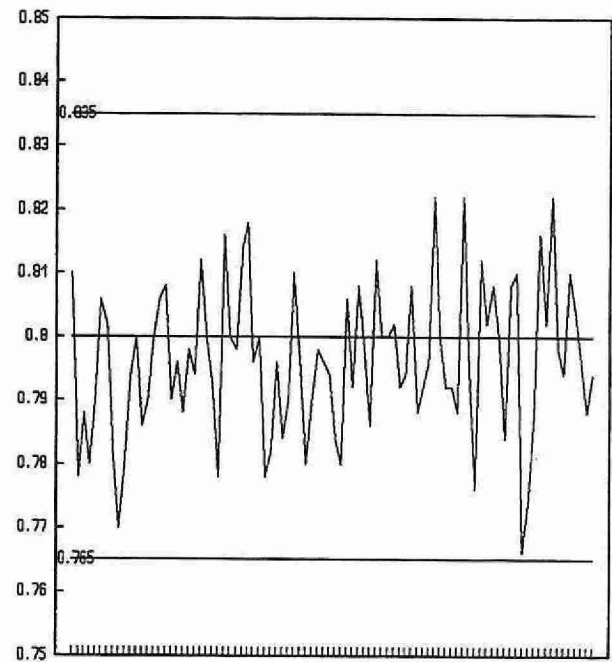
	n	Mean	Standard Deviation (1)
Long Term Blank	90	-0.0014	0.0054

NITROGEN, AMMONIA PLUS AMMONIUM (mg/L as N)

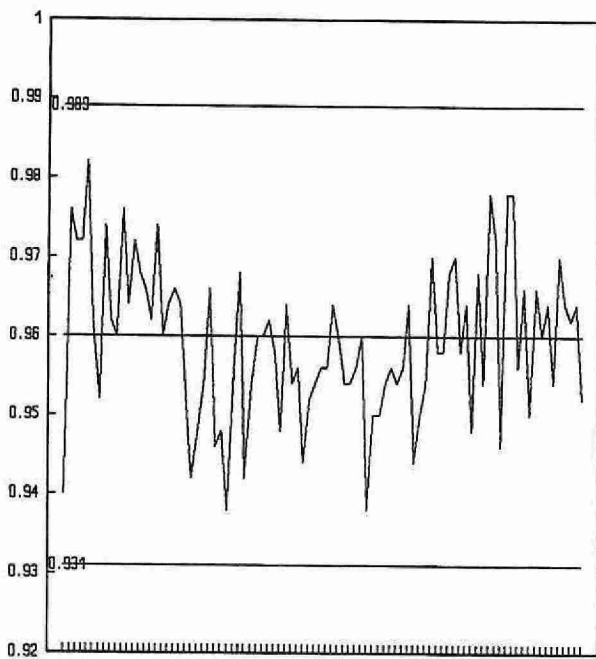
QUALITY CONTROL DATA FROM 03/01/95 TO 13/12/95



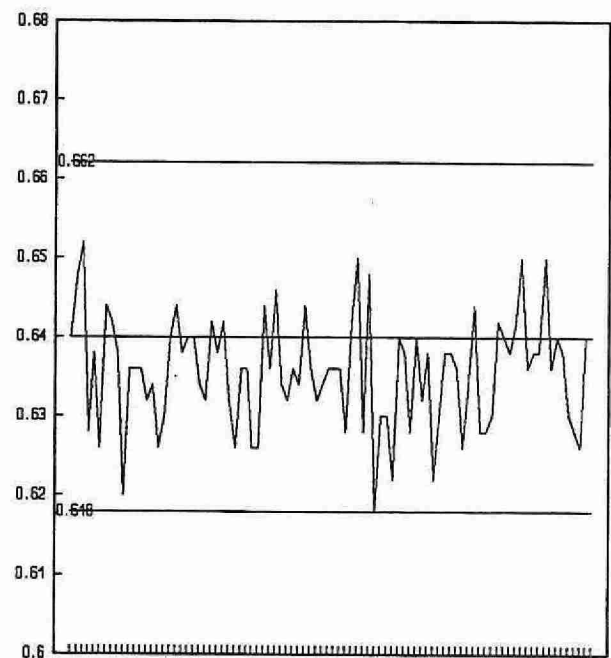
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

CONTROL LIMIT

## NITROGEN, AMMONIA PLUS AMMONIUM

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/77
Method Reference No	E3366A	Units	mg/L as N
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Leachate, Domestic Waters, Effluents		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the supernatant of a settled sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst.

Approximate absorbance: 0.7 at the full scale level.

Reactive orthophosphate, nitrogen-nitrite and nitrogen-nitrate plus nitrite are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus one 38°C heating bath (7.7 mL delay).

Colourimetric measurement is through a 1.5 cm. light path at 630 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

### NOTES:

Sept.'94 the method codes SDNP-E3223A, E3193A, E3184A and E3185 were amalgamated and a new method code SDNP-E3366A was generated.

# NITROGEN, AMMONIA PLUS AMMONIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 13/12/95

Laboratory Unit: Colourimetry

Full Scale: to 50.0 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	94	40.0	40.05	0.05	0.1740
B:	94	20.0	19.98	-0.02	0.1154
C:	94	4.00	4.011	0.011	0.0403
A+B:	94	60.0	60.03	0.03	0.2102
A-B:	94	20.0	20.07	0.07	0.2073
B+C:	94	24.0	23.993	-0.007	0.1319
B-C:	94	16.0	15.97	-0.03	0.1118

s.d.(AB) S(between runs): 0.15

Sw(within run): 0.15

S/Sw: 1.0

s.d.(BC) S(between runs): 0.086

Sw(within run): 0.079

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

58.76	-	61.24	for A+B
19.07	-	20.93	for A-B
23.34	-	24.66	for B+C
15.50	-	16.50	for B-C

## DUPLICATES:

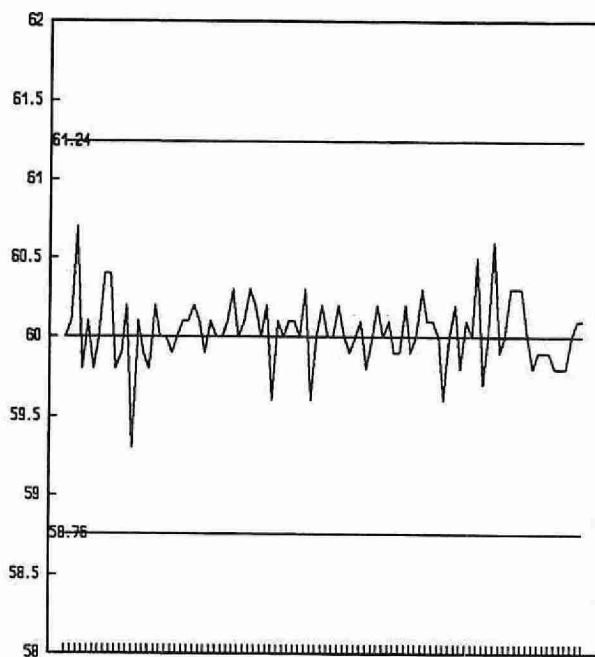
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
242	0.00 - 5.00	0.0429	16.0
15	5.10 - 10.0	0.1385	1.5
23	10.1 - 25.0	0.3299	2.1
2	25.1 - 50.0	N.A.	N.A.
282	Overall	0.0566	

## OTHER CHECKS:

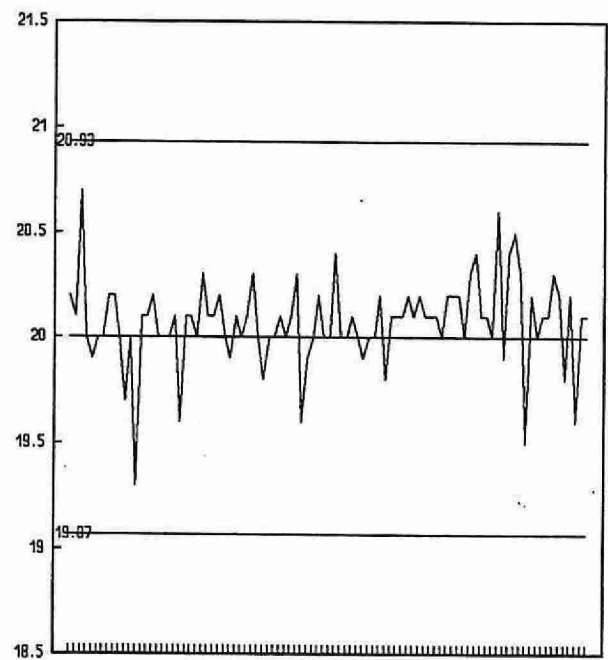
	n	Mean	Standard Deviation (1)
Long Term Blank	94	-0.0048	0.0395

NITROGEN, AMMONIA PLUS AMMONIUM (mg/L as N)

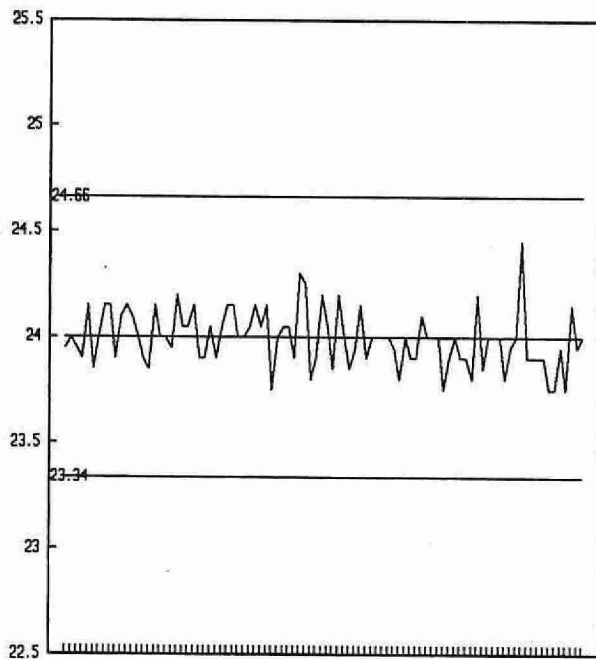
QUALITY CONTROL DATA FROM 03/01/95 TO 13/12/95



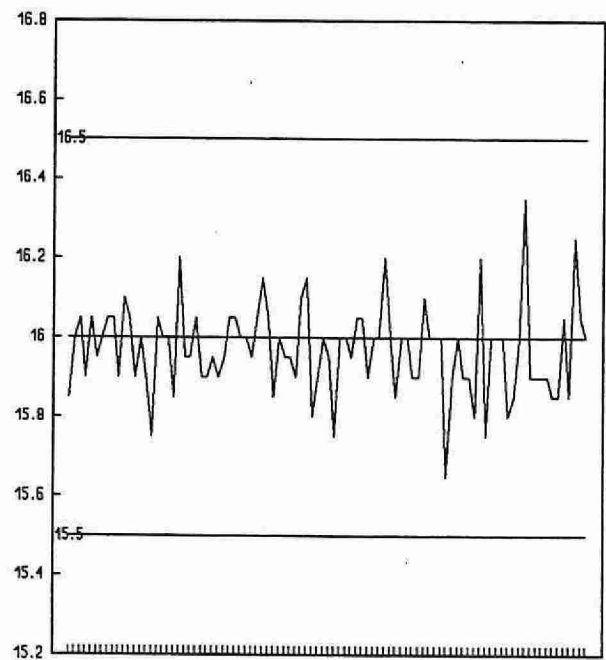
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

CONTROL LIMIT

## NITROGEN, AMMONIA PLUS AMMONIUM

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/06/76
Method Reference No.	E3374A	Units	µg/L as N
LIMS Product Code	AMMNO3374	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation, and Soil Leachates		

### SAMPLING:

Quantity Required:	50 mL
Container:	Glass or plastic

### ANALYTICAL PROCEDURE:

Ammonia plus ammonium ions are determined on the sample via the formation of indophenol blue in a buffered system using nitroprusside as a catalyst. A reference stream, which differs from the colour formation stream by replacement of the catalyst with an equal flow of water, is employed to suppress sample matrix effects.

Approximate absorbance : 0.40 at the full scale level.

Nitrate plus nitrite is determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 2 of 37°C heating bath (7.7 mL delay). Colourimetric measurement is through a 5.0 cm. light path at 630 nm. Two analytical ranges are obtained from the output of the colourimeter.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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### CALIBRATION:

BL plus 8 standards

### CONTROLS:

Calibration	LTBL plus 3 QC standards, e.g. QCA
Drift	BL every 10 samples and BL plus check standard every 20 samples

### NOTES:

JAN. 1995 LIMS replaced LIS and the method reference no. was changed from E3033A to E3374A. LIMS product code is AMMNO3374.



# NITROGEN, AMMONIA PLUS AMMONIUM

QUALITY CONTROL DATA FROM 11/01/95 TO 21/12/95

Laboratory: Dorset

Full Scale: to 1000 µg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	55	600	600.3	0.3	4.9711
B:	55	200	198.3	-1.7	2.1435
C:	55	60	58.1	-1.9	3.2562
A+B:	55	800	799.2	-0.8	5.4013
A-B:	55	400	401.5	1.5	5.4258
B+C:	55	260	257	-3	4.3289
B-C:	55	140	140.8	0.8	3.4139

s.d.(AB) S(between runs): 3.83

Sw(within run): 3.83

S/Sw: 1.0

s.d.(BC) S(between runs): 2.76

Sw(within run): 2.41

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

780	-	820	for	A+B
380	-	420	for	A-B
245	-	275	for	B+C
125	-	155	for	B-C

## DUPLICATES:

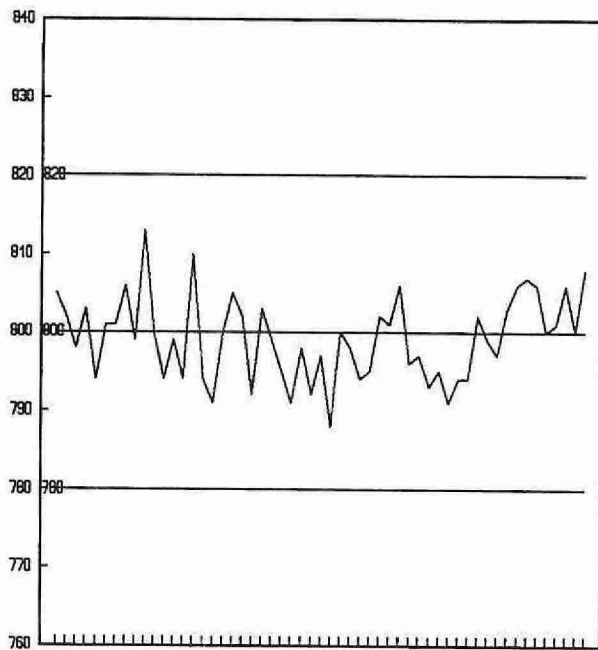
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
142	0.0 - 100	2.1689	9.8
6	101 - 200	3.3854	1.9
6	201 - 500	3.4448	1.1
3	501 - 1000	3.8167	0.63
157	Overall	2.2508	

## OTHER CHECKS:

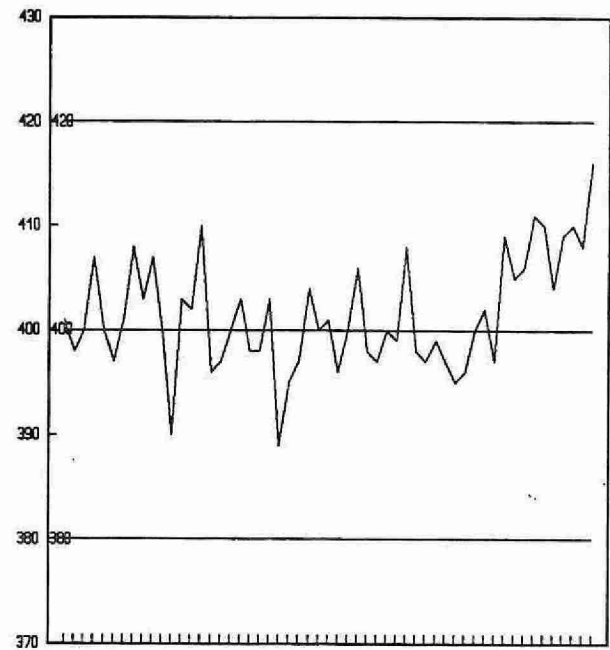
	n	Mean	Standard Deviation (1)
Long Term Blank	55	0.927	0.9594

# NITROGEN, AMMONIA PLUS AMMONIUM ( $\mu\text{g/L as N}$ )

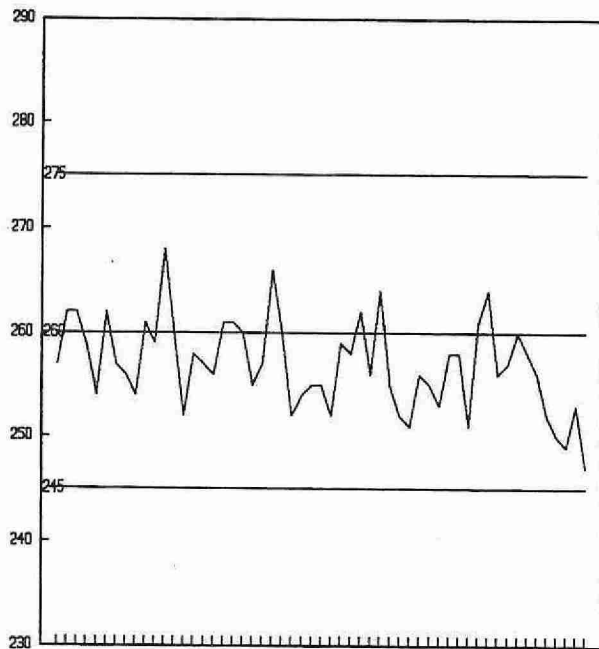
QUALITY CONTROL DATA FROM 11/01/95 TO 21/12/95



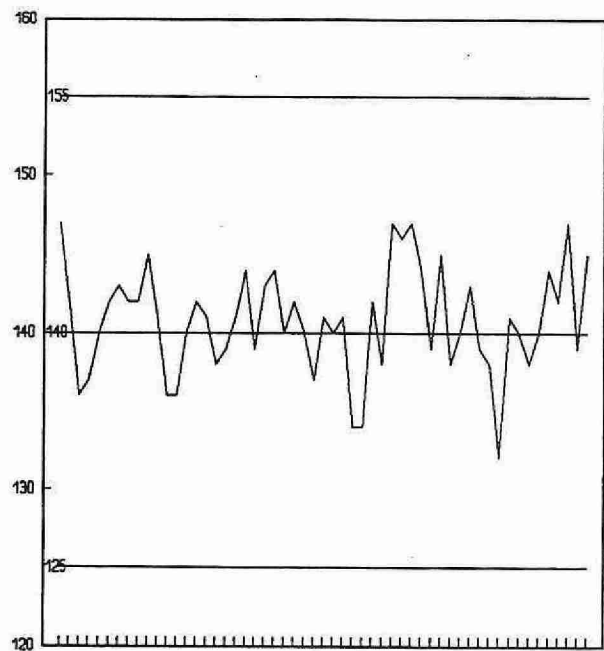
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## NITROGEN, NITRATE

### IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/07/80
Method Reference No	E3148A	Units	µg/Filter as N
LIMS Product Code	LOV3148, ANLOV3148, NYL3148, TEF3148, ANION3148	Supervisor	F. Lo
Sample Type/Matrix	W40 filters from LoVol filter packs, Teflon and Nylon filters from LoVol and Sequential filter packs		

### SAMPLING:

Quantity Required	1 filter
Container	50 mL polypropylene tube

### SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW (W40) or 25.0 mL of DDW (Teflon) or 25.0 mL of 0.03N NaOH (Nylon) in polypropylene tubes with ultrasonic treatment followed by a 24 hour rest period.

### ANALYTICAL PROCEDURE:

Nitrate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with  $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$  to match the eluent strength and maintain background conductivity. The concentration of nitrate in mg/L as N is determined by the comparison of the sample peak heights to a series of standards. Results are converted to µg/filter as N. Chloride and sulphate are determined simultaneously.

### INSTRUMENTATION:

Ultrasonic bath; modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing and partial data processing.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01 mg/L	Current T value: 0.05 mg/L
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### CALIBRATION:

BL plus 9 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

### NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received. To convert unit from mg/L to µg/Filter, the concentration of N in mg/L is multiplied by 50 for W40 filters or 25 for Teflon and Nylon filters.

# NITROGEN, NITRATE

QUALITY CONTROL DATA FROM 13/01/95 TO 26/10/95

Laboratory Unit: Ion Chromatography

Full Scale: to 2.0 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	29	1.60	1.617	0.017	0.0136
B:	29	0.40	0.402	0.002	0.0040
A+B:	29	2.00	2.019	0.019	0.0150
A-B:	29	1.20	1.215	0.015	0.0133

s.d.(AB)      S(between runs): 0.010      Sw(within run): 0.009      S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

1.93 - 2.07 for A+B  
1.15 - 1.25 for A-B

## DUPLICATES:

For W40 filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
14	0 - 0.40	0.0022	1.4
13	0.41 - 1.20	0.0012	0.3
2	1.21 - 2.00	N.A.	N.A.
29	Overall	0.0018	

For Teflon filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
52	0 - 0.20	0.0030	23.8
2	0.21 - 0.40	N.A.	N.A.
2	0.41 - 1.20	N.A.	N.A.
2	1.21 - 2.00	N.A.	N.A.
58	Overall	0.0036	

# NITROGEN, NITRATE

QUALITY CONTROL DATA FROM 13/01/95 TO 26/10/95

Laboratory Unit: Ion Chromatography

Full Scale: to 2.0 mg/L as N

## DUPLICATES:

For Nylon filters:

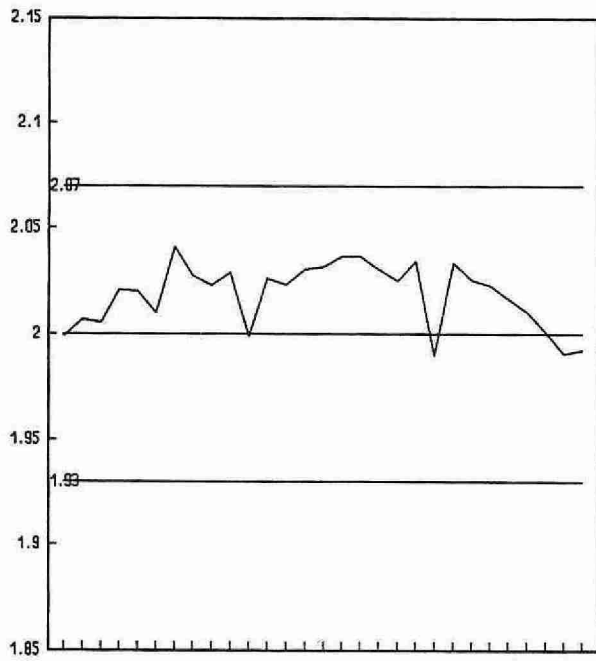
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
45	0 - 0.20	0.0022	2.2
16	0.21 - 0.40	0.0042	2.0
16	0.41 - 1.20	0.0092	1.5
1	1.21 - 2.00	N.A.	N.A.
78	Overall	0.0039	

## OTHER CHECKS:

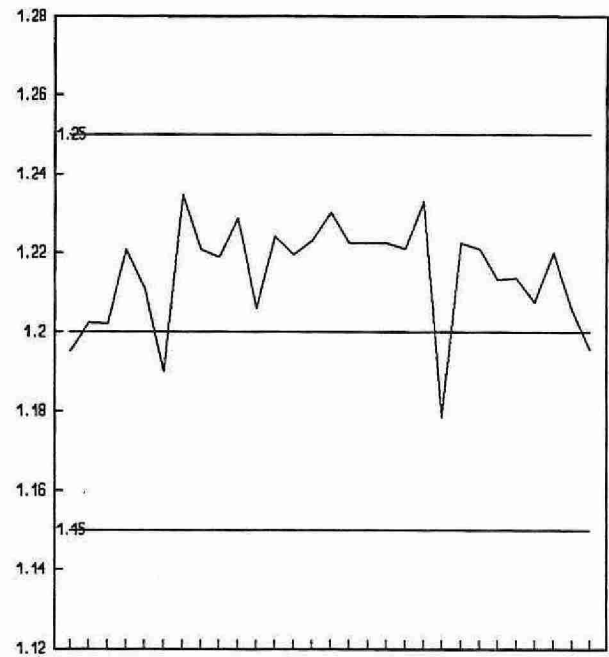
	n	Mean	Standard Deviation (1)
Long Term Blank	29	0.0012	0.0035

NITROGEN, NITRATE (mg/L as N)

QUALITY CONTROL DATA FROM 13/01/95 TO 26/10/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## NITROGEN, NITRATE

### IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3372A	Units	mg/L as N
LIMS Product Code	ANION3372	Supervisor	F. Lo
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

### SAMPLING:

Quantity Required	15 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Nitrate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with  $\text{Na}_2\text{CO}_3/\text{NaHCO}_3$  to match the eluent strength and maintain background conductivity. The concentration of nitrate in mg/L as N is determined by the comparison of the sample peak heights to a series of standards.

Sulphate and chloride are determined simultaneously.

### INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

### NOTES:

Formerly method E3147A, method number changed for LIMS in 1993 to E3372A.

# NITROGEN, NITRATE

QUALITY CONTROL DATA FROM 12/01/95 TO 21/12/95

Laboratory Unit: Ion Chromatography

Full Scale: to 1.0 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	19	0.80	0.808	0.008	0.0129
B:	19	0.20	0.195	-0.005	0.0128
A+B:	19	1.00	1.004	0.004	0.0236
A-B:	19	0.60	0.613	0.013	0.0103

s.d.(AB)    S(between runs): 0.012    Sw(within run): 0.007    S/Sw: 1.8

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.96    -    1.04    for    A+B  
0.57    -    0.63    for    A-B

## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
11	0.00 - 0.20	0.0047	8.6
14	0.21 - 0.50	0.0041	2.1
7	0.51 - 1.00	0.0121	2.7
32	Overall	0.0060	

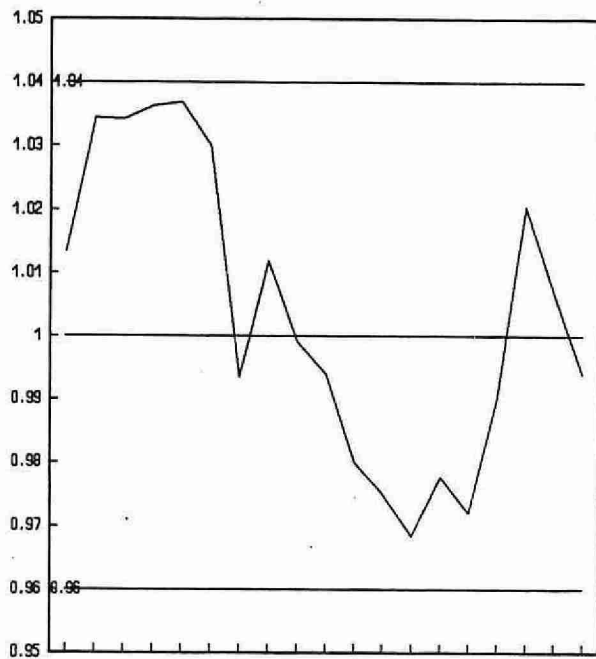
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	19	0	0

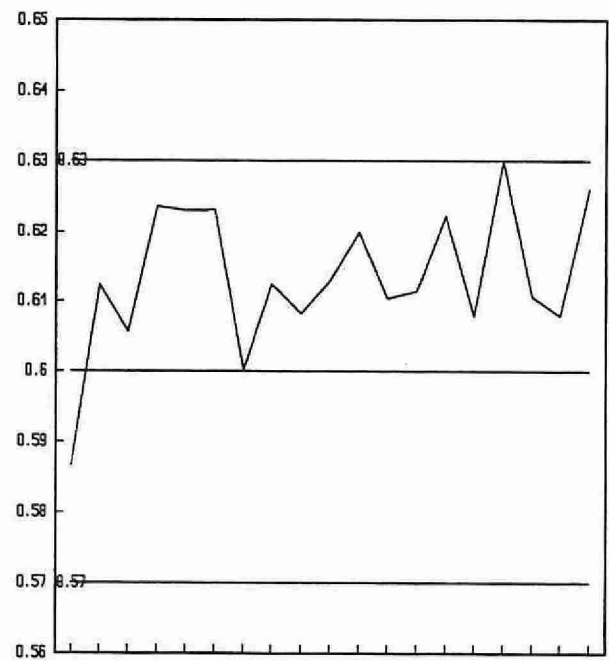


NITROGEN, NITRATE (mg/L as N)

QUALITY CONTROL DATA FROM 12/01/95 TO 21/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## NITROGEN, NITRATE PLUS NITRITE

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No	E3364A	Units	mg/L as N
LIMS Product Code	DISNUT3364	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 37°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step.

Approximate absorbance: 0.6 at the full scale level.

Ammonia plus ammonium, nitrite, and reactive orthophosphate are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37°C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 1.5 cm. light path at 520 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

### NOTES:

Sept.'94 the method codes RNDNP-E3174A, E3175A, E3208A and E3266 were amalgamated and a new method code RNDNP-E3364A was generated.

# NITROGEN, NITRATE PLUS NITRITE

QUALITY CONTROL DATA FROM 04/01/95 TO 14/12/95

Laboratory Unit: Colourimetry

Full Scale: to 5.00 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	90	4.00	3.99	-0.01	0.0350
B:	90	2.00	2.009	0.009	0.0222
C:	90	0.400	0.405	0.005	0.0108
A+B:	90	6.00	5.99	0.01	0.0413
A-B:	90	2.00	1.98	-0.02	0.0415
B+C:	90	2.40	2.41	-0.01	0.0287
B-C:	90	1.60	1.604	0.004	0.0197

s.d.(AB) S(between runs): 0.029

Sw(within run): 0.029

S/Sw: 1.0

s.d.(BC) S(between runs): 0.017

Sw(within run): 0.014

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

5.868	-	6.132	for	A+B
1.901	-	2.099	for	A-B
2.328	-	2.472	for	B+C
1.546	-	1.654	for	B-C

## DUPLICATES:

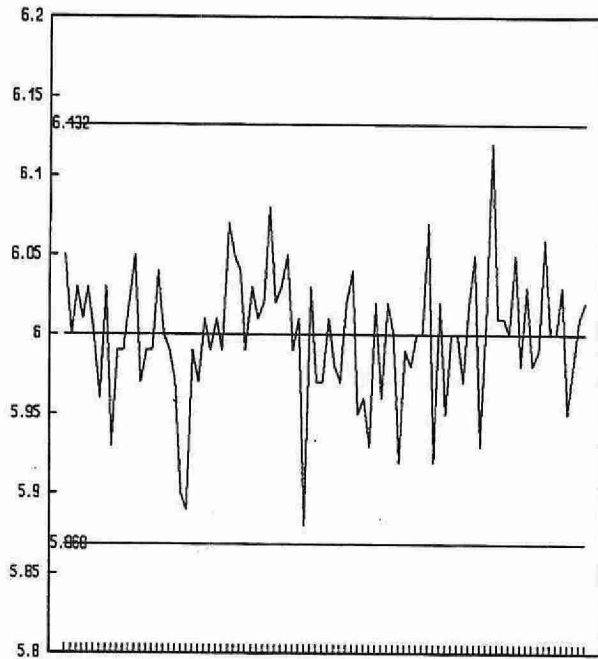
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
179	0.000 - 0.500	0.0088	31.0
17	0.501 - 1.00	0.0124	3.6
45	1.01 - 2.50	0.0341	7.2
18	2.51 - 5.00	0.0569	1.7
259	Overall	0.0144	

## OTHER CHECKS:

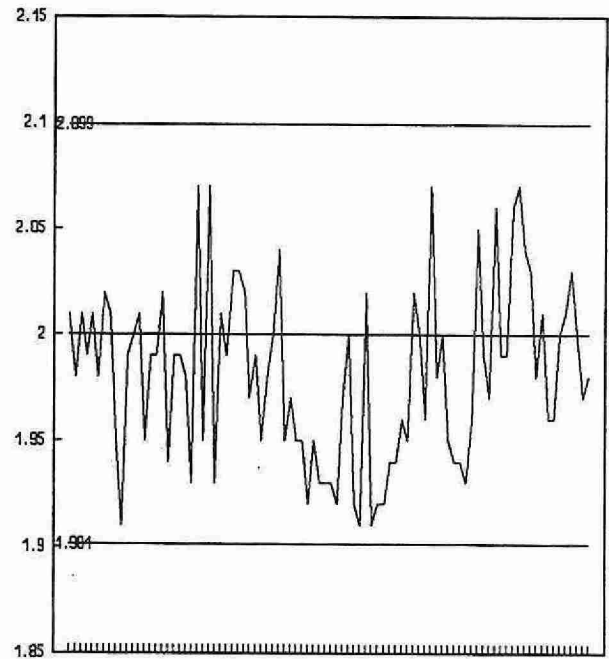
	n	Mean	Standard Deviation (1)
Long Term Blank	90	-0.0009	0.0047

NITROGEN, NITRATE PLUS NITRITE (mg/L as N)

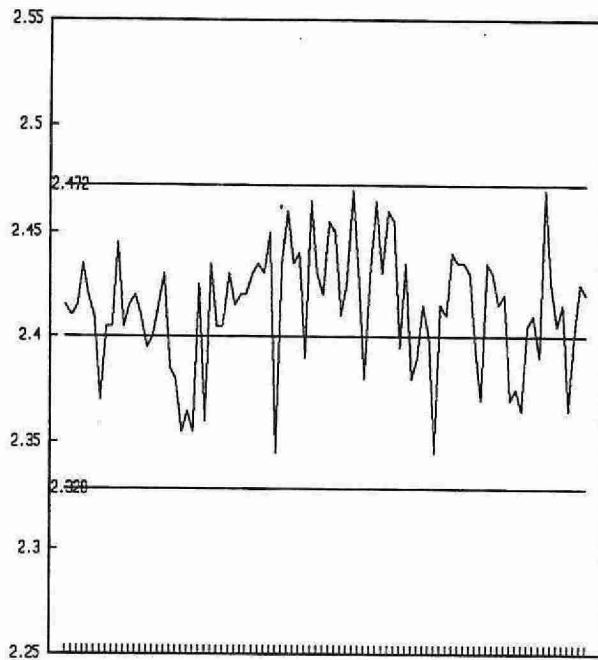
QUALITY CONTROL DATA FROM 04/01/95 TO 14/12/95



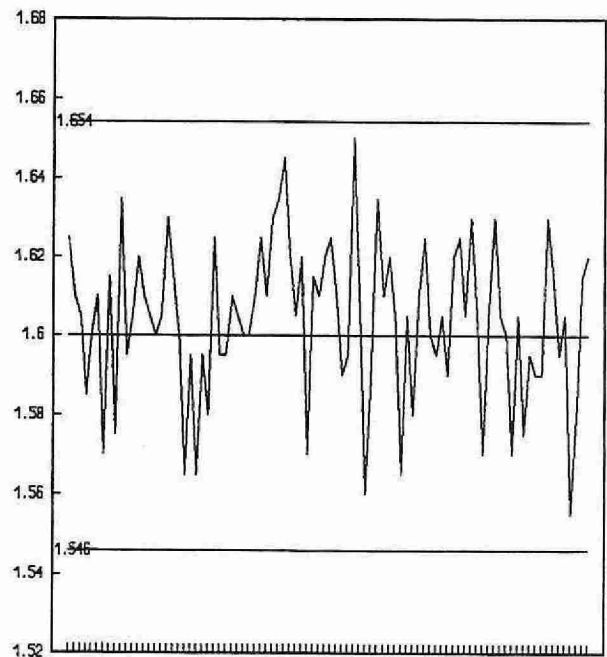
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

CONTROL LIMIT

## NITROGEN, NITRATE PLUS NITRITE

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No	E3366A	Units	mg/L as N
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Leachate, Domestic Waters		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 38°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step. Approximate absorbance: 0.7 at the full scale level.

Ammonia plus ammonium, nitrite, and reactive phosphate are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 38°C heating bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm. light path at 520 nm. Two analytical ranges are obtained from the output of the colourimeter. Data capture, reduction, and processing via a multi - stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

### NOTES:

Sept.'94 the method codes SDNP-E3223A, E3193A, E3184A and E3185 were amalgamated and a new method code SDNP-E3366A was generated.

# NITROGEN, NITRATE PLUS NITRITE

QUALITY CONTROL DATA FROM 03/01/95 TO 13/12/95

Laboratory Unit: Colourimetry

Full Scale: to 50.0 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	94	40.0	39.98	-0.02	0.2436
B:	94	20.0	19.97	-0.03	0.1570
C:	94	4.00	3.99	-0.01	0.0623
A+B:	94	60.0	59.95	-0.05	0.3308
A-B:	94	20.0	20.01	0.01	0.2420
B+C:	94	24.0	23.96	-0.04	0.1910
B-C:	94	16.0	15.98	-0.02	0.1434

s.d.(AB) S(between runs): 0.205

Sw(within run): 0.171

S/Sw: 1.2

s.d.(BC) S(between runs): 0.119

Sw(within run): 0.101

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

58.66	-	61.34	for	A+B
18.99	-	21.01	for	A-B
23.28	-	24.72	for	B+C
15.46	-	16.54	for	B-C

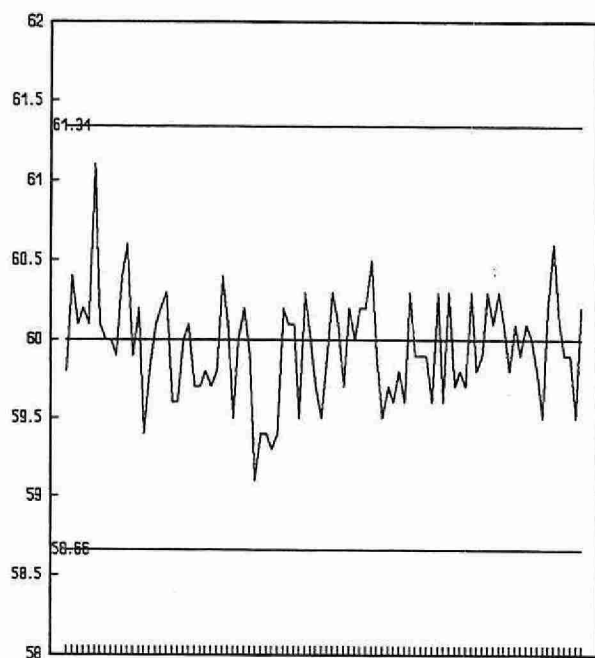
## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
199	0.000 - 5.00	0.0349	6.0
25	5.01 - 10.0	0.1224	1.5
51	10.1 - 25.0	0.2123	1.4
4	25.1 - 50.0	0.5822	1.5
279	Overall	0.0694	

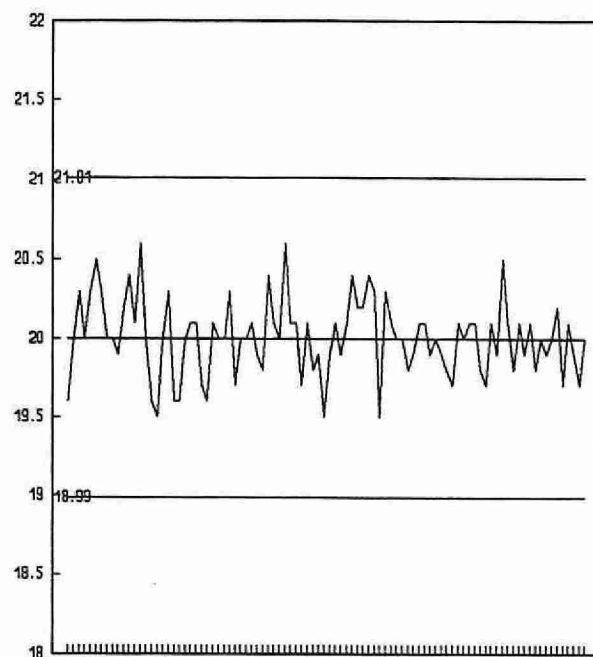
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	94	0.0165	0.0411

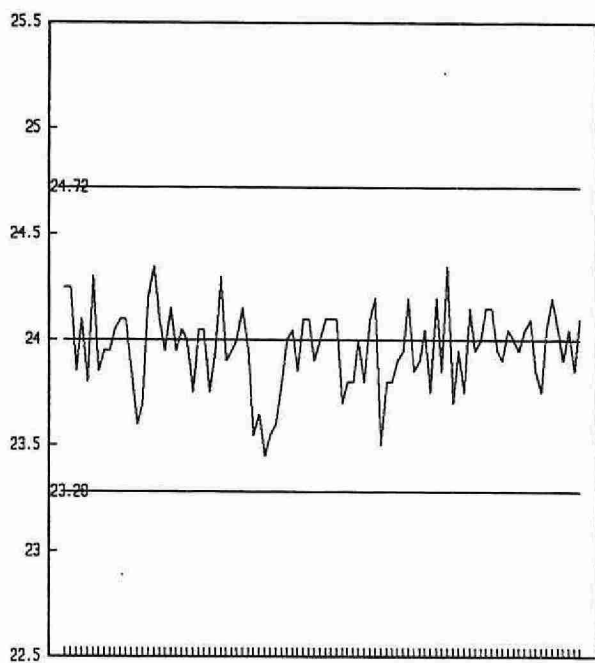
NITROGEN, NITRATE PLUS NITRITE (mg/L as N)  
QUALITY CONTROL DATA FROM 03/01/95 TO 13/12/95



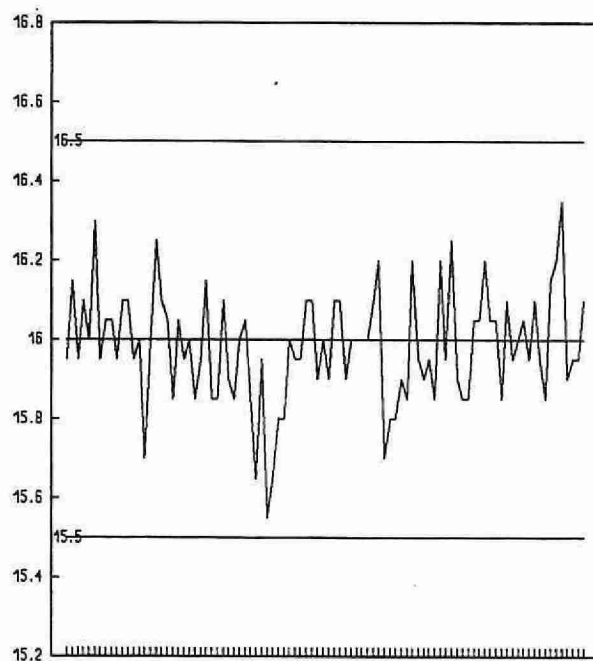
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## NITROGEN, NITRATE PLUS NITRITE

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/76
Method Reference No	E3369A	Units	mg/L as N
LIMS Product Code	FNOT3369	Supervisor	J. McBride
Sample Type/Matrix	Ministry of Health Water Samples		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a settled sample. Nitrate is reduced to nitrite in alkaline media at 38°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step. Approximate absorbance: 0.5 at the full scale level.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37°C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 1.5 cm. light path at 520 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.1	Current T value: 0.5
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### CALIBRATION:

BL plus 6 standards

### CONTROLS:

Calibration	LTB plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

### NOTES:

Sept.'94 the method codes WFNO3-E3221A, and E3220A were amalgamated and a new method code WFNO3-E3369A was generated.



# NITROGEN, NITRATE PLUS NITRITE

QUALITY CONTROL DATA FROM 04/01/95 TO 15/12/95

Laboratory Unit: Colourimetry

Analytical Range: to 20.0 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	71	16.0	16.027	0.027	0.0925
B:	71	8.0	8.048	0.048	0.0606
C:	71	1.60	1.601	0.001	0.0206
A+B:	71	24.0	24.075	0.075	0.1092
A-B:	71	8.0	7.979	-0.021	0.1120
B+C:	71	9.60	9.649	0.049	0.0694
B-C:	71	6.40	6.446	0.046	0.0581

s.d.(AB)      S(between runs): 0.078      Sw(within run): 0.079      S/Sw: 0.99

s.d.(BC)      S(between runs): 0.045      Sw(within run): 0.041      S/Sw: 1.1

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

23.21	-	24.79	for	A+B
7.41	-	8.59	for	A-B
9.15	-	10.05	for	B+C
5.95	-	6.85	for	B-C

## DUPLICATES:

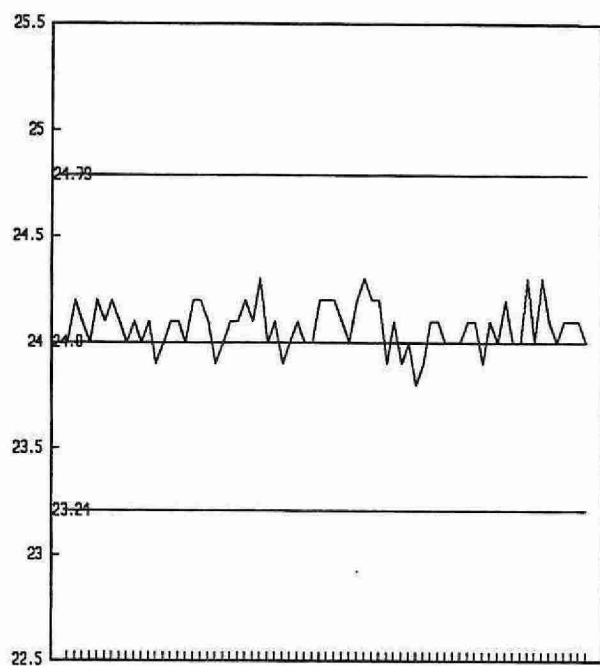
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
133	0 - 2.0	0.0856	18.8
12	2.1 - 4.0	0.1275	4.3
18	4.1 - 10.0	0.0781	1.1
8	10.1 - 20.0	0.1750	1.2
171	Overall	0.0940	

## OTHER CHECKS:

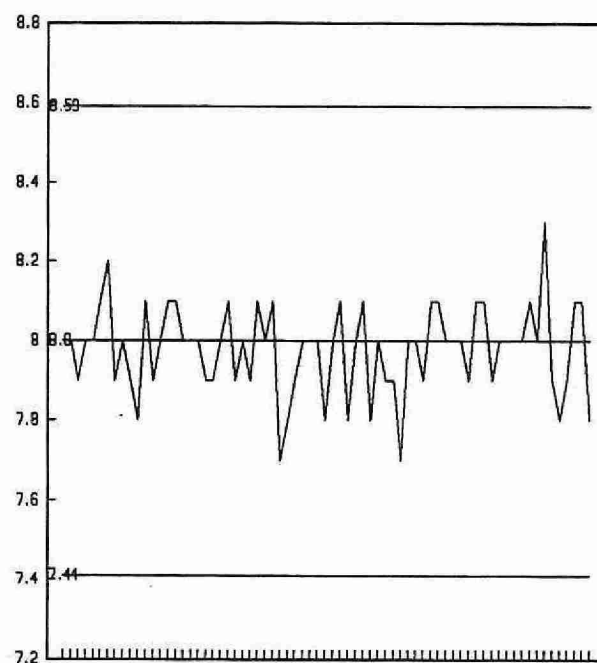
	n	Data Mean	Standard (1) Deviation
Long Term Blank	71	0	0

# NITROGEN, NITRATE PLUS NITRITE (mg/L as N)

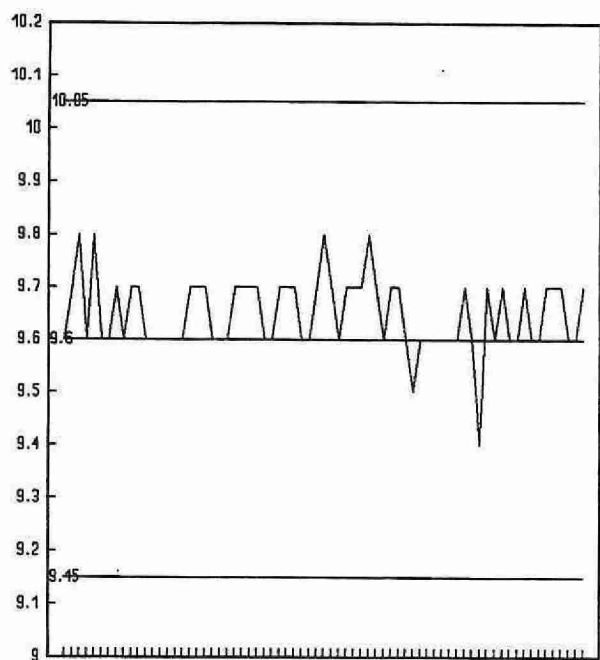
QUALITY CONTROL DATA FROM 04/01/95 TO 15/12/95



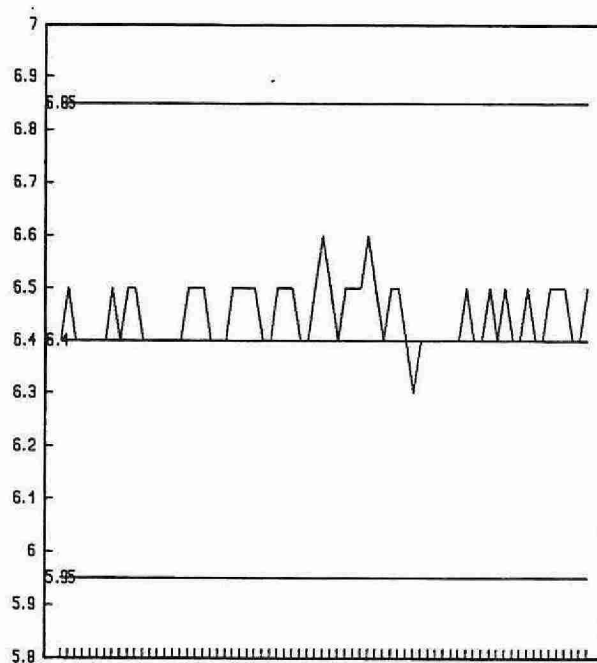
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

CONTROL LIMIT

## NITROGEN, NITRATE PLUS NITRITE

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	13/06/78
Method Reference No.	E3374A	Units	µg/L as N
LIMS Product Code	AMMNO3374	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation, and Soil Leachates		

### SAMPLING:

Quantity Required:	50 mL
Container:	Glass or plastic

### ANALYTICAL PROCEDURE:

Nitrate plus nitrite is determined on the supernatant of a sample. Nitrate is reduced to nitrite in alkaline media at 37°C, by hydrazine sulphate with copper as a catalyst. Colourimetry is based on the formation of an azo dye by nitrite, sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride. To control metal ion interference, samples are passed through an ion-exchange column prior to the reduction step. Approximate absorbance : 0.4 at the full scale level.

Ammonia plus ammonium is determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus the following modules: 37°C heating bath (7.7 mL delay), ion exchange column. Colourimetric measurement is through a 5.0 cm. light path at 520 nm.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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### CALIBRATION:

BL plus 8 standards

### CONTROLS:

Calibration	LTBL plus 3 QC standards, e.g. QCA
Drift	BL every 10 samples and BL plus check standard every 20 samples

### NOTES:

JAN. 1995 LIMS replaced LIS and the method reference no. was changed from E3034A to E3374A. LIMS product code is AMMNO3374.

# NITROGEN, NITRATE PLUS NITRITE

QUALITY CONTROL DATA FROM 11/01/95 TO 21/12/95

Laboratory: Dorset

Full Scale: to 1000 µg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	54	600	601.5	1.5	6.4506
B:	54	200	199.0	1.0	2.9966
C:	54	60	60.7	0.7	1.7116
A+B:	54	800	800.5	0.5	8.5710
A-B:	54	400	402.6	2.6	5.2648
B+C:	54	260	259.7	-0.3	4.1889
B-C:	54	140	138.3	1.7	2.5042

s.d.(AB) S(between runs): 5.03

Sw(within run): 3.72

S/Sw: 1.3

s.d.(BC) S(between runs): 2.44

Sw(within run): 1.77

S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

780	-	820	for	A+B
380	-	420	for	A-B
245	-	275	for	B+C
125	-	155	for	B-C

## DUPLICATES:

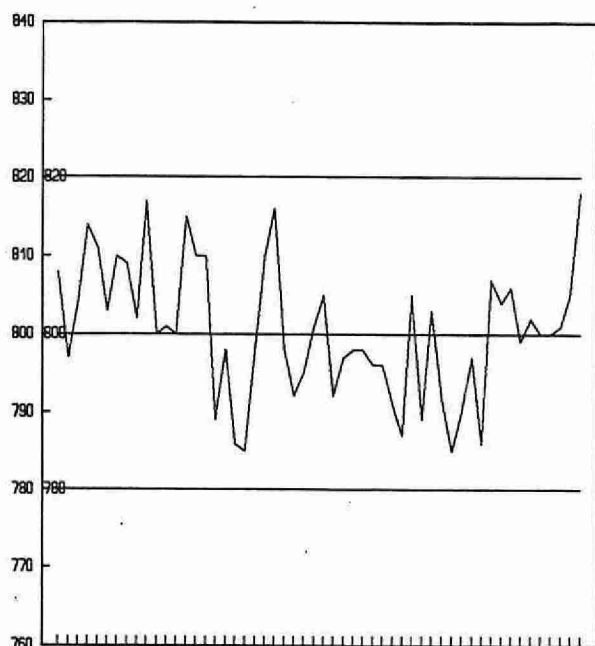
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
53	0.0 - 100	1.3031	7.9
24	101 - 200	2.4537	3.1
52	201 - 500	3.6703	2.2
24	501 - 1000	4.9074	1.0
153	Overall	3.1447	

## OTHER CHECKS:

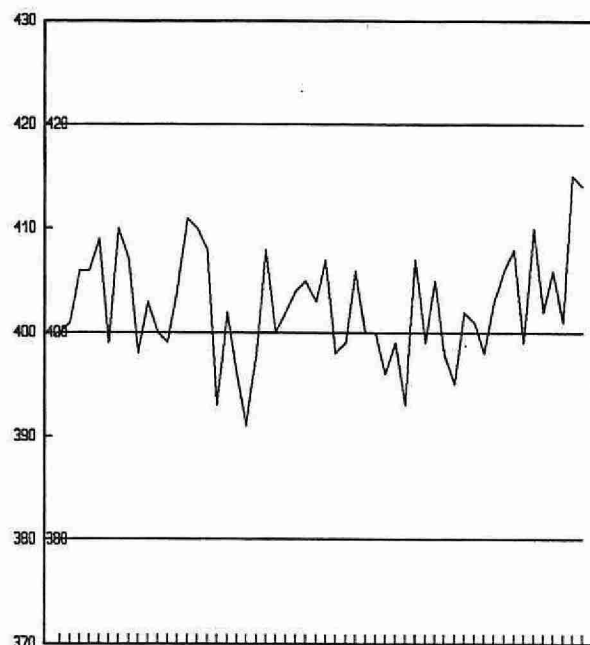
	n	Mean	Standard Deviation (1)
Long Term Blank	54	0.074	0.2619

# NITROGEN, NITRATE PLUS NITRITE ( $\mu\text{g/L}$ as N)

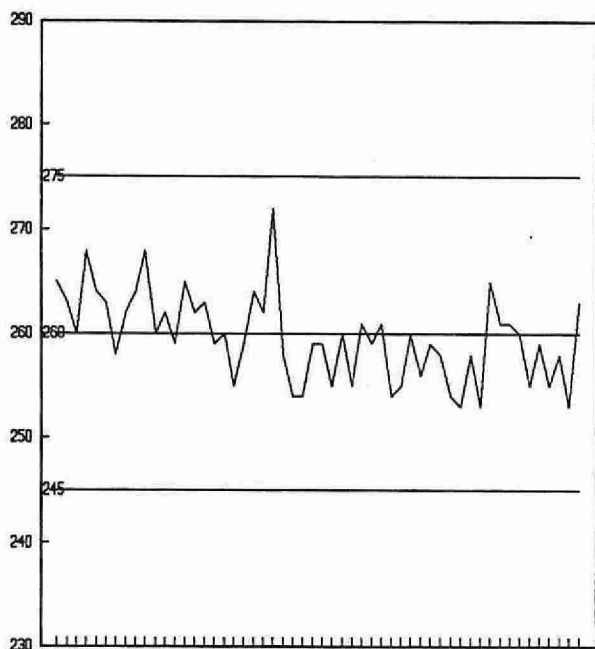
QUALITY CONTROL DATA FROM 11/01/95 TO 21/12/95



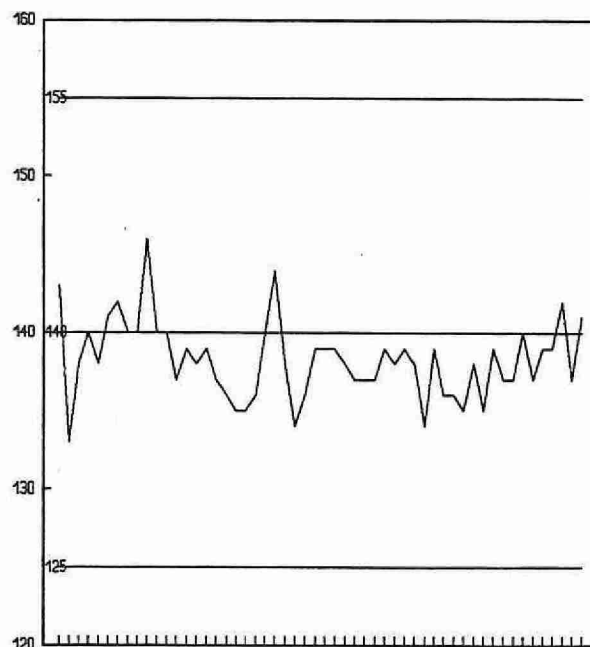
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## NITROGEN, NITRITE

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No	E3364A	Units	mg/L as N
LIMS Product Code	DISNUT3364	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Nitrite is determined on the supernatant of a settled sample by formation of an azo dye using sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride.

Approximate absorbance: 0.6 at the full scale level.

Ammonia plus ammonium, nitrate plus nitrite, and reactive orthophosphate are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 520 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.001	Current T value: 0.005
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

### NOTES:

Sept. '94 the method codes SDNP-E3223A, E3193A, E3184A and E3185 were amalgamated and a new method code SDNP-E3366A was generated.

# NITROGEN, NITRITE

QUALITY CONTROL DATA FROM 04/01/95 TO 14/12/95

Laboratory Unit: Colourimetry

Full Scale: to 0.200 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	90	0.160	0.161	0.001	0.0015
B:	90	0.080	0.0796	-0.0004	0.0012
C:	90	0.016	0.0160	0.0000	0.0008
A+B:	90	0.240	0.2405	0.0005	0.0023
A-B:	90	0.080	0.081	0.001	0.0015
B+C:	90	0.096	0.0957	-0.0003	0.0016
B-C:	90	0.064	0.0636	-0.0004	0.0013

s.d.(AB) S(between runs): 0.0014

Sw(within run): 0.0010

S/Sw: 1.3

s.d.(BC) S(between runs): 0.0010

Sw(within run): 0.0009

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.234	-	0.246	for	A+B
0.076	-	0.084	for	A-B
0.092	-	0.100	for	B+C
0.061	-	0.067	for	B-C

## DUPLICATES:

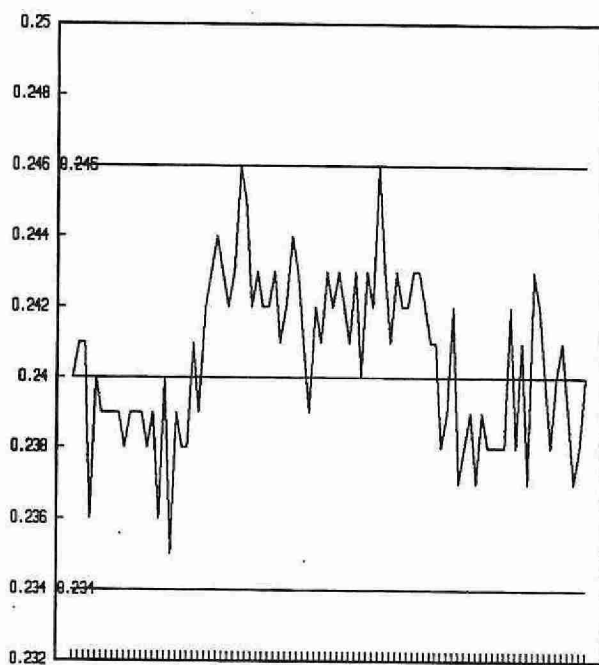
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
213	0.000 - 0.020	0.0011	29.0
29	0.021 - 0.040	0.0024	22.8
22	0.041 - 0.100	0.0027	5.5
2	0.101 - 0.200	N.A.	N.A.
266	Overall	0.0014	

## OTHER CHECKS:

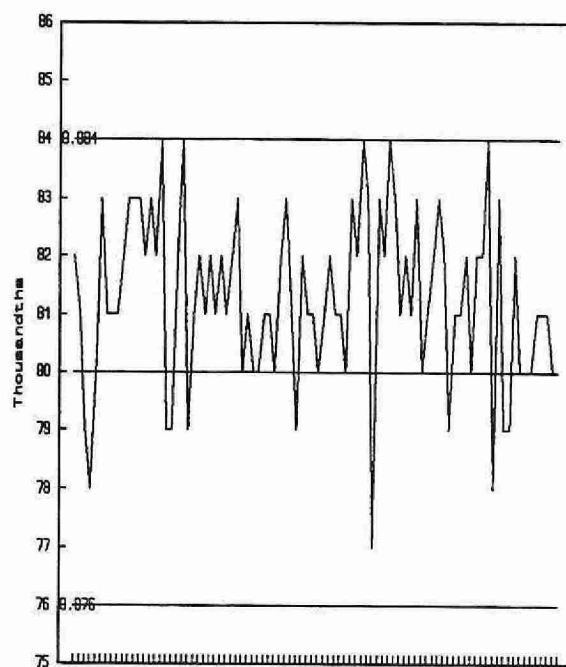
	n	Mean	Standard Deviation (1)
Long Term Blank	90	0.00011	0.0007

# NITROGEN, NITRITE (mg/L as N)

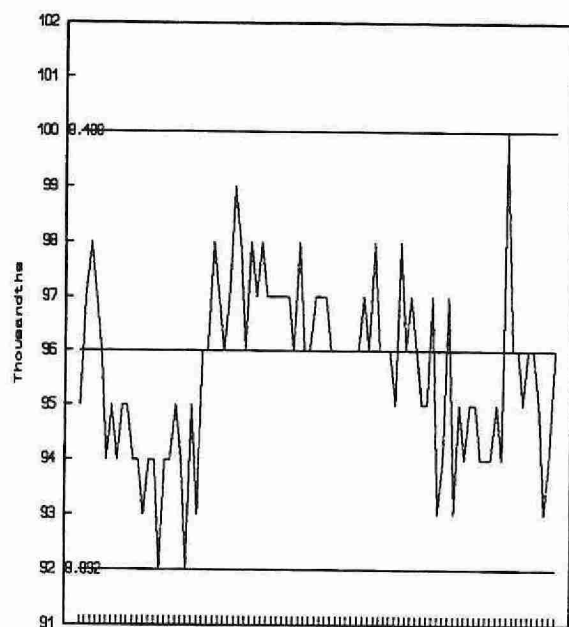
QUALITY CONTROL DATA FROM 04/01/95 TO 14/12/95



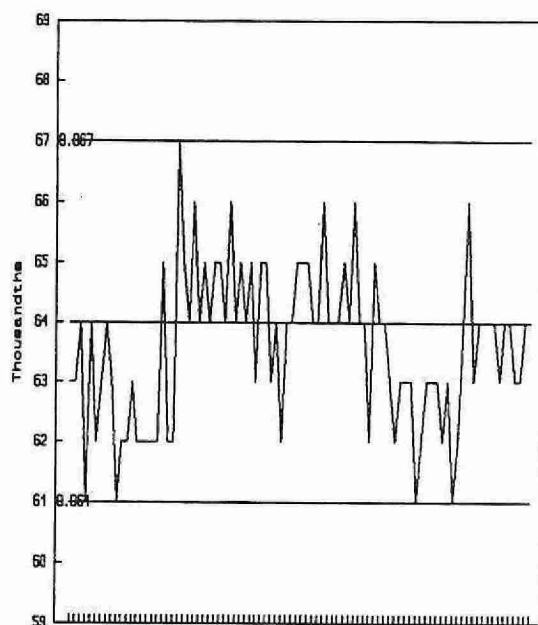
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

CONTROL LIMIT



## NITROGEN, NITRITE

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/78
Method Reference No	E3366A	Units	mg/L as N
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Leachate, Domestic Waters		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Nitrite is determined on the supernatant of a settled sample by formation of an azo dye using sulphanilamide, and N(1-naphthyl) ethylenediamine dihydrochloride.

Approximate absorbance: 0.3 at the full scale level.

Ammonia plus ammonium, nitrate plus nitrite, and reactive orthophosphate are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 520 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples
Interference	Nitrate standard spiked with calcium (150 mg/L) and magnesium (50 mg/L) confirms effective interference suppression.
Recovery	Individual nitrate and nitrite standards of equal N concentration show effectiveness of reduction step.

### NOTES:

Sept.'94 the method codes SDNP-E3223A, E3193A, E3184A and E3185 were amalgamated and a new method code SDNP-E3366A was generated.

# NITROGEN, NITRITE

QUALITY CONTROL DATA FROM 03/01/95 TO 13/12/95

Laboratory Unit: Colourimetry

Full Scale: to 2.00 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	94	1.60	1.602	0.002	0.0092
B:	94	0.80	0.800	0.000	0.0044
C:	94	0.160	0.1602	0.0002	0.0016
A+B:	94	2.40	2.402	0.002	0.0111
A-B:	94	0.80	0.802	0.002	0.0093
B+C:	94	0.960	0.9602	0.0002	0.0051
B-C:	94	0.640	0.6398	-0.0002	0.0042

s.d.(AB) S(between runs): 0.0072

Sw(within run): 0.0066

S/Sw: 1.1

s.d.(BC) S(between runs): 0.0033

Sw(within run): 0.0030

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.352	-	2.448	for	A+B
0.764	-	0.836	for	A-B
0.936	-	0.984	for	B+C
0.622	-	0.658	for	B-C

## DUPLICATES:

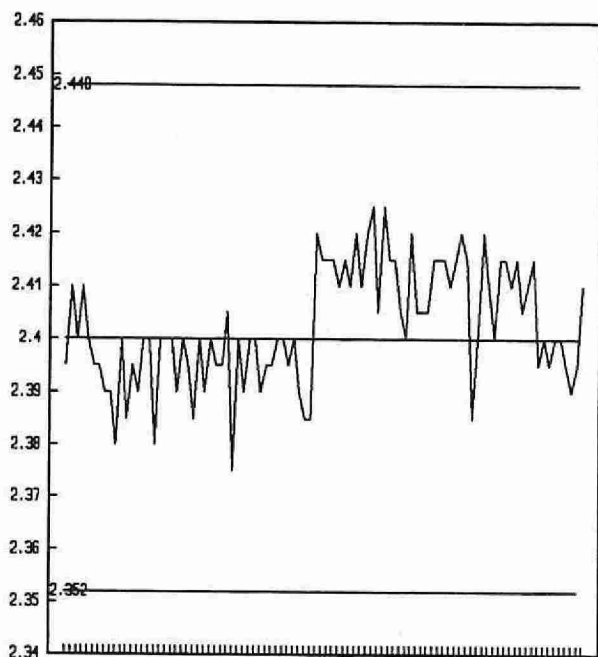
n . Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
237	0.000 - 0.200	0.0101	42.8
14	0.201 - 0.400	0.0112	4.8
14	0.401 - 1.00	0.0318	7.4
10	1.01 - 2.00	0.0329	5.5
275	Overall	0.0223	

## OTHER CHECKS:

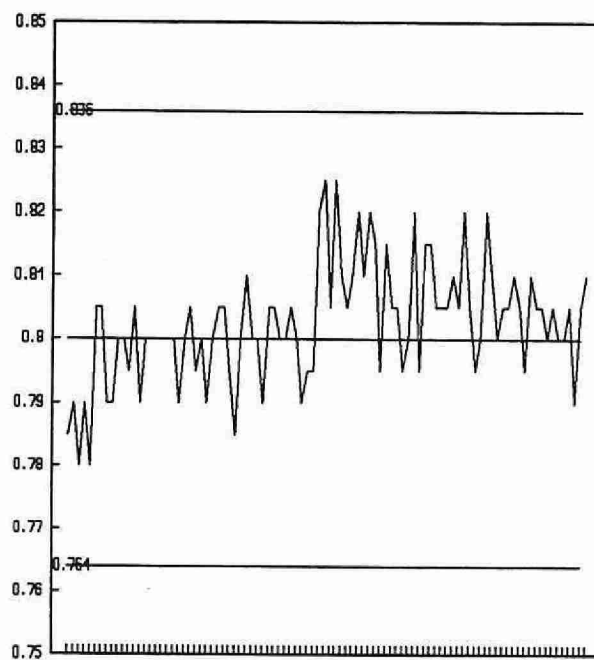
	n	Mean	Standard Deviation (1)
Long Term Blank	94	0.0001	0.0010

# NITROGEN, NITRITE (mg/L as N)

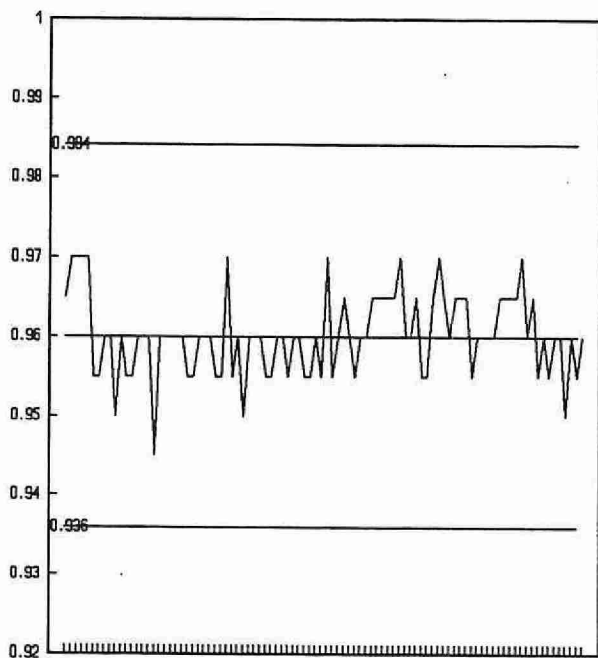
QUALITY CONTROL DATA FROM 03/01/95 TO 13/12/95



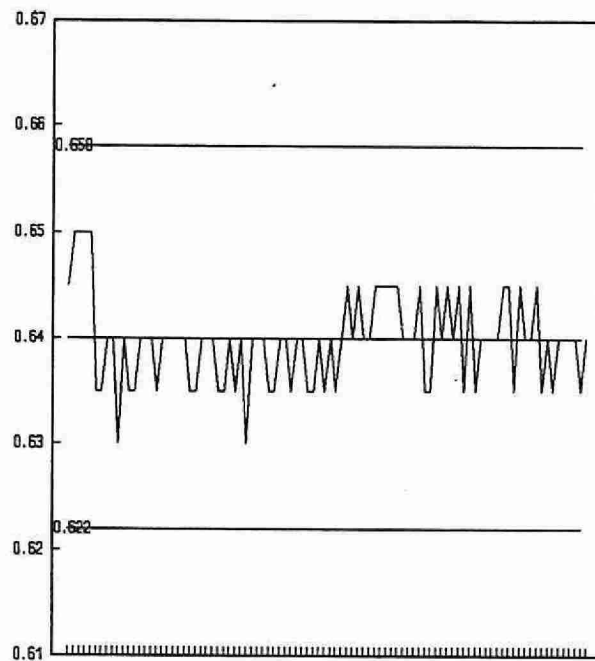
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## NITROGEN,TOTAL KJELDAHL

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	Mar '89
Method Reference No	E3116A	Units	mg/g as N
LIMS Product Code	TNP3116	Supervisor	F. Lo
Sample Type/Matrix	Soil, Sediment and Sludge		

### SAMPLING:

Quantity Required	0.08 to 0.4 g
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Nitrogen compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

### INSTRUMENTATION:

Hot plate .

Basic automated modular continuous flow system : 37.5°C bath. Colourimetric measurement is through a 5 cm. light path at 630 nm.

Data capture, and processing via a microcomputer system.

### REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.1	Current T value: 0.5
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### CALIBRATION:

3 High and 2 Low Calibration Standards

### CONTROLS:

Calibration	In house composite B-Soil/sediment, plus QC Soils/Sediment (RS92)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

### NOTES:

System is calibrated with undigested standards.

# NITROGEN, TOTAL KJELDAHL

QUALITY CONTROL DATA FROM 01/01/95 TO 01/12/95

Laboratory Unit: Colourimetry

Full Scale: 20 mg/g as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
RS92	42	1.69	1.557	-.033	0.0764

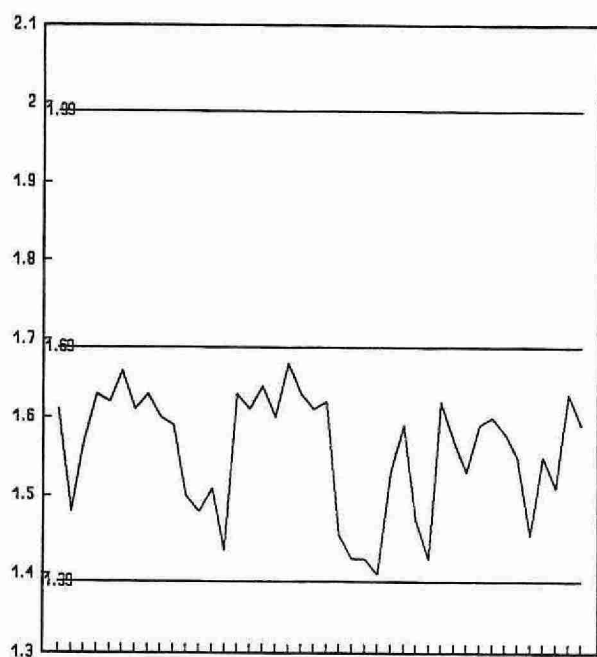
The calibration is accepted if the calibration control values obtained lie within the ranges:  
1.39 - 1.99 for RS92

## DUPLICATES: (Sediment/Soils)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
55	0.00 - 2.00	0.0547	4.6
22	2.01 - 4.00	0.1405	4.6
8	4.01 - 10.0	0.1868	3.7
3	10.1 - 20.0	0.4348	3.2
88	Overall	0.0957	

NITROGEN, TOTAL KJELDAHL (mg/g as N)

QUALITY CONTROL DATA FROM 01/01/95 TO 01/12/95



QUALITY CONTROL STANDARD  
RS92 - Sediment and soil control

CONTROL LIMIT

## NITROGEN, TOTAL KJELDAHL

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	Mar '89
Method Reference No	E3118A	Units	mg/g as N
LIMS Product Code	TNP3118	Supervisor	F. Lo
Sample Type/Matrix	Terrestrial and aquatic vegetation		

### SAMPLING:

Quantity Required	0.02 to 0.04 g
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Nitrogen compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

### INSTRUMENTATION:

Hot plate.

Basic automated modular continuous flow system : 37.5°C bath. Colourimetric measurement is through a 5 cm. light path at 630 nm.

Data capture, and processing via a microcomputer system.

### REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.20	Current T value: 1.00
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### CALIBRATION:

3 High and 2 Low Calibration Standards

### CONTROLS:

Calibration	In house composite A-VEG, plus QC VEG (Pine Needles)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

### NOTES:

System is calibrated with undigested standards.

# NITROGEN, TOTAL KJELDAHL

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95

Laboratory Unit: Colourimetry

Full Scale: 100 mg/g as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
Pine Needles (certified)	42	12.10	11.76	-0.34	0.7672

The calibration is accepted if the calibration control values obtained lie within the ranges:  
10.3 - 13.9 for Pine Needles

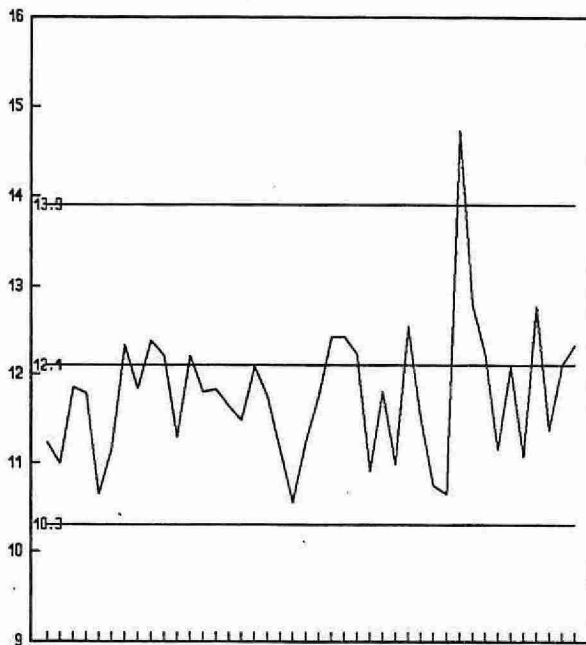
## DUPLICATES: (Vegetation)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
0	0.0 - 5.0	N.A.	N.A.
0	5.1 - 10.0	N.A.	N.A.
41	10.1 - 25.0	0.8246	3.9
47	25.1 - 50.0	0.8673	2.2
88	Overall	0.8470	



NITROGEN, TOTAL KJELDAHL (mg/g as N)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD  
(Pine needle)

\_\_\_\_\_ CONTROL LIMIT

## NITROGEN, TOTAL KJELDAHL

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3367A	Units	mg/L as N
LIMS Product Code	TOTNUT3367	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digestors kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line in two stages and then ammonia is determined by formation of indophenol blue in a buffered system using nitroprusside as a catalyst.

Approximate absorbance: 0.3 at the full scale level.

Total phosphorus is determined simultaneously.

### INSTRUMENTATION:

Three block digesters

Basic automated modular continuous flow system plus 1 module: 38°C bath (7.7 mL delay). Colourimetric measurement is through a 5.0 cm. light path at 630 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
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### CALIBRATION:

BL plus 7 undigested standards

### CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

# NITROGEN, TOTAL KJELDAHL

QUALITY CONTROL DATA FROM 05/01/95 TO 21/12/95

Laboratory Unit: Colourimetry

Full Scale: to 2.00 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	121	1.60	1.609	0.009	0.0116
B:	121	0.800	0.802	0.002	0.0083
C:	121	0.160	0.1605	0.0005	0.0060
A+B:	121	2.40	2.421	0.001	0.0169
A-B:	121	0.800	0.807	0.007	0.0110
B+C:	121	0.960	0.962	0.002	0.0110
B-C:	121	0.640	0.641	0.001	0.0094

s.d.(AB)	S(between runs):	0.010	Sw(within run):	0.008	S/Sw: 1.3
s.d.(BC)	S(between runs):	0.0073	Sw(within run):	0.0066	S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

2.32	-	2.48	for	A+B
0.740	-	0.860	for	A-B
0.913	-	1.007	for	B+C
0.605	-	0.675	for	B-C

## RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
121	1.40	1.398	0.0317
121	0.840	0.835	0.0231
121	0.280	0.278	0.0163

## DUPLICATES:

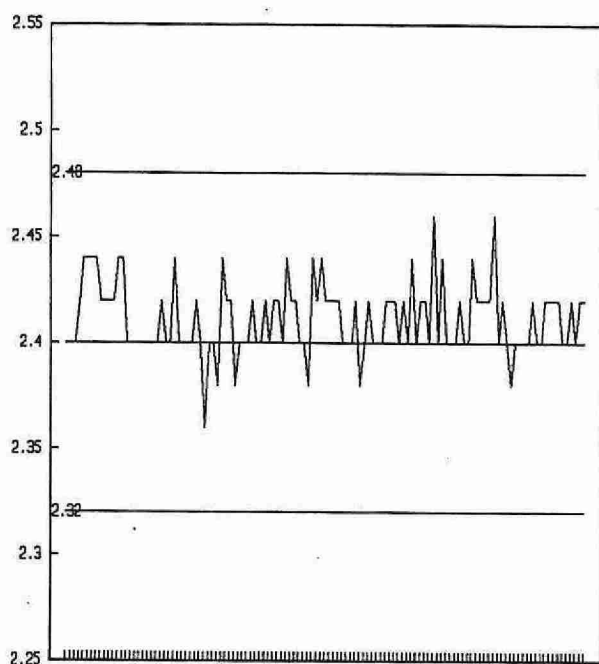
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
58	0.000 - 0.200	0.0188	14.0
129	0.201 - 0.400	0.0173	7.1
140	0.401 - 1.00	0.0332	9.1
24	1.01 - 2.00	0.0679	5.5
351	Overall	0.0252	

## OTHER CHECKS:

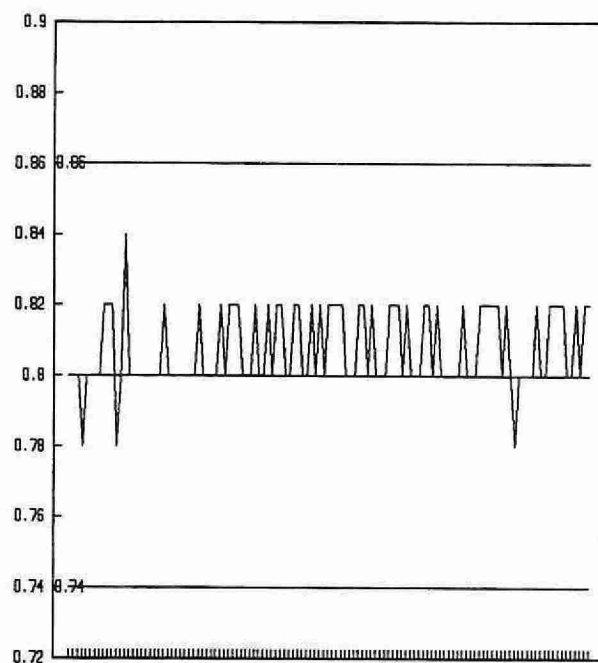
	n	Mean	Standard Deviation (1)
Long Term Blank	121	-0.0010	0.0044
Digested Blank	121	0.0189	0.0099

# NITROGEN, TOTAL KJELDAHL (mg/L as N)

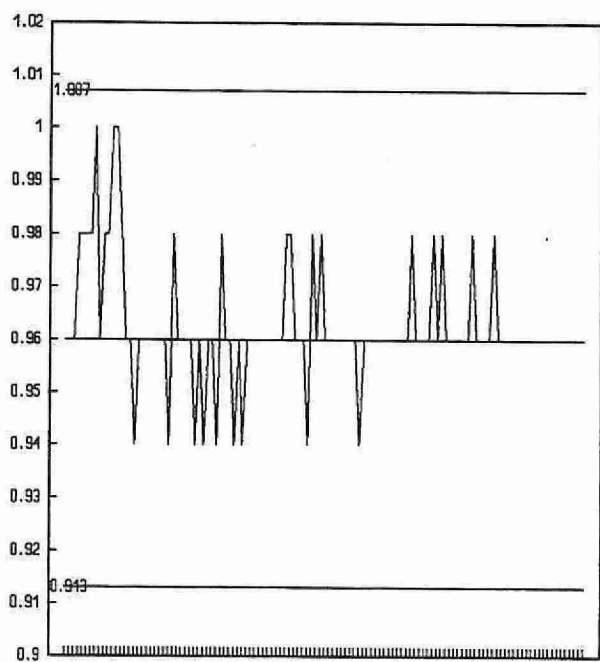
QUALITY CONTROL DATA FROM 05/01/95 TO 21/12/95



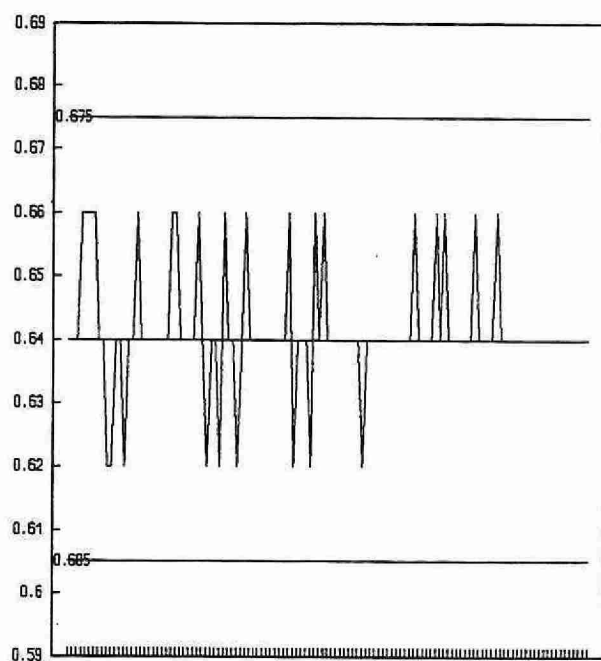
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## NITROGEN, TOTAL KJELDAHL

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3368A	Units	mg/L as N
LIMS Product Code	TOTNUT3368	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Domestic Waters, Effluents, Leachates		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digestors kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line in two stages and then ammonia is determined by formation of indophenol blue in a buffered system using nitroprusside as a catalyst.

Approximate absorbance: 1.1 at the full scale level.

Total phosphorus is determined simultaneously.

### INSTRUMENTATION:

Three block digesters

Basic automated modular continuous flow system plus 1 module: 38°C bath (7.7 mL delay). Colourimetric measurement is through a 1.5 cm. light path at 630 nm.

Data capture, reduction, and processing via a multi-stage microcomputer system

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

BL plus 7 undigested standards

### CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

### NOTES:

System is calibrated with undigested standards.

# NITROGEN, TOTAL KJELDAHL

QUALITY CONTROL DATA FROM 05/01/95 TO 13/12/95

Laboratory Unit: Colourimetry

Full Scale: to 50.0 mg/L as N

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	86	40.0	39.988	-0.012	0.1704
B:	86	20.0	20.017	0.017	0.0984
C:	86	4.0	4.013	0.013	0.0601
A+B:	86	60.0	60.006	0.006	0.2144
A-B:	86	20.0	19.971	-0.029	0.1775
B+C:	86	24.0	24.031	0.031	0.1381
B-C:	86	16.0	16.004	0.004	0.0868

s.d.(AB)	S(between runs):	0.139	Sw(within run):	0.125	S/Sw: 1.1
s.d.(BC)	S(between runs):	0.082	Sw(within run):	0.061	S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

59.27	-	60.73	for	A+B
19.45	-	20.55	for	A-B
23.58	-	24.42	for	B+C
15.68	-	16.32	for	B-C

## RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
86	35	35.04	0.4359
86	21	21.02	0.2916
86	7	6.99	0.1034

## DUPLICATES:

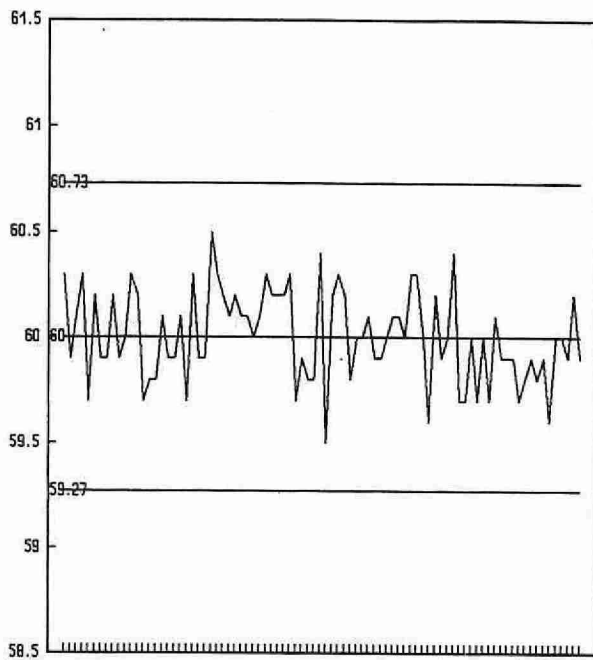
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
187	0.00 - 5.00	0.0703	14.0
23	5.01 - 10.0	0.2598	21.7
30	10.1 - 25.0	0.4683	5.8
16	25.1 - 50.0	0.6364	1.8
256	Overall	0.1291	

## OTHER CHECKS:

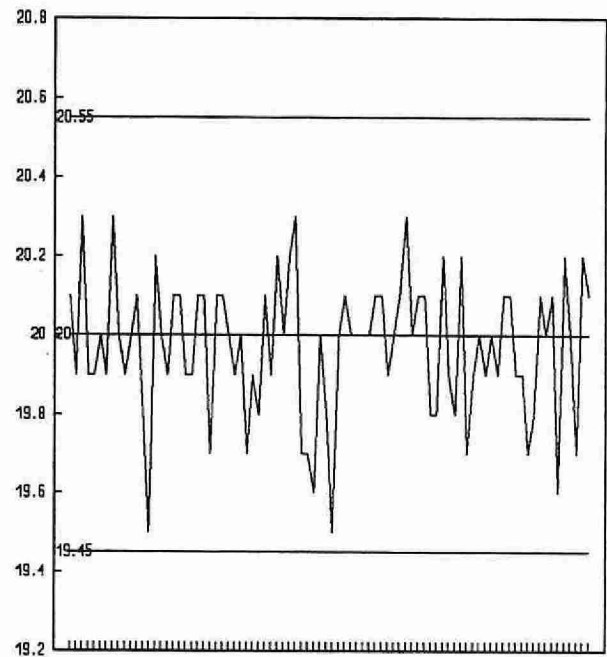
	n	Mean	Standard Deviation (1)
Long Term Blank	86	0.003	0.0382
Digested Blank	86	0.009	0.0662

# NITROGEN, TOTAL KJELDAHL (mg/L as N)

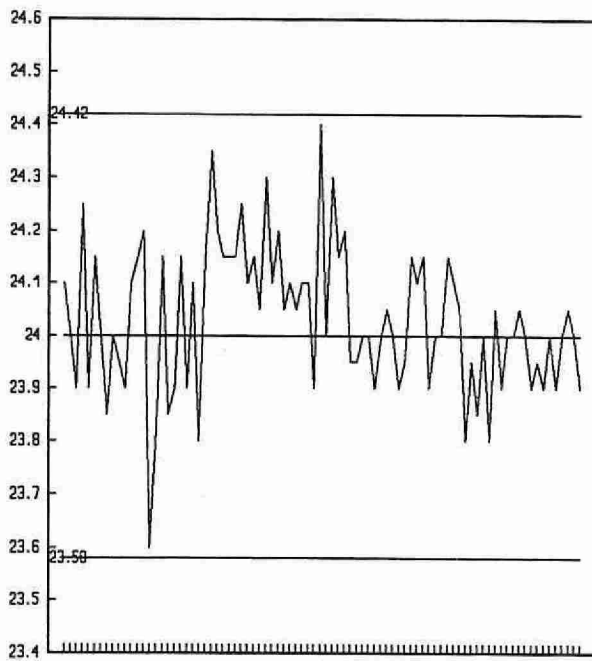
QUALITY CONTROL DATA FROM 05/01/95 TO 13/12/95



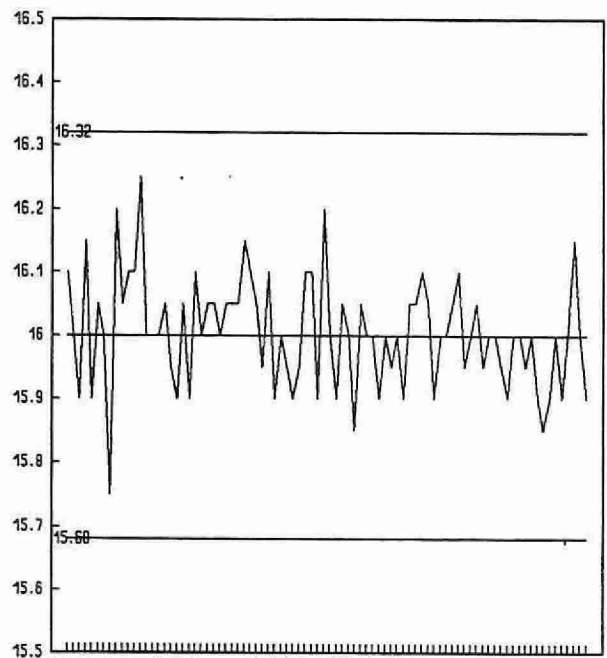
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## OXYGEN DEMAND, BIOCHEMICAL

### IDENTIFICATION:

Laboratory Unit:	BOD	Method Introduced:	Before '61
Method Reference No:	E3182A	Units:	mg/L as O
LIMS Product Code:	BOD3182	Supervisor:	F. Lo
Sample Type/Matrix:	Sewage, Industrial Waste, Effluents, Domestic Waters, Leachates		

### SAMPLING:

Quantity Required:	400 mL
Container:	Glass or plastic

### SAMPLE PREPARATION:

If necessary sample pH is adjusted to neutral and chlorine is removed by reaction with sodium sulphite.

### ANALYTICAL PROCEDURE:

Oxygen depletion is measured as the difference in dissolved oxygen (DO) concentration. DO readings are taken prior to sample storage, and also at the end of storage in the dark at 20°C for five days (BOD5). If necessary, dilutions are made with aerated, nutrient-enriched water to obtain a 25-75% oxygen depletion. If the sample has undergone any of the sample preparation steps listed above or if the sample is an industrial waste, a sewage seed is added. For such samples, calculation of an appropriate seed correction is required.

### INSTRUMENTATION:

- YSI Model 59 DO meter (Yellow Springs Instrument Company) with DO probe equipped with stirrer and fitted with a Teflon membrane of 0.5 mil thickness which is permeable to oxygen (1 mil = 0.001 inch).
- Titration equipment for Winkler analysis of dissolved oxygen.
- Incubator (19-21°C); BOD bottles (300 mL)

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION (DO):

The standard is air-saturated reversed osmosis deionized water. The DO content is read from a table (ORBISPHERE LABORATORIES - Pressure temperature dissolved oxygen table) after measuring its temperature and the barometric pressure in the laboratory.



## OXYGEN DEMAND, BIOCHEMICAL cont'd

### CONTROLS:

Calibration (DO)	2 QC solutions of Pure-DW water which have been partially stripped of DO by flushing with nitrogen. These "solutions", of different but unknown DO, are compared using the Oxygen meter and the Winkler titration procedure. The difference between the values for the two analytical methods is utilized as a slope control for the DO Analyzer.
Recovery (BOD5)*	3 Recovery standards prepared from a combination of Glucose and Glutamic Acid e.g. R1; the expected BOD5 is 67% of the oxygen requirement for complete oxidation.
Drift	Air saturated Pure-DW water after every 24 samples.
Blanks*	Pure-DW water and BOD dilution water

### NOTES:

\* These solutions are incubated for five days alongside samples.

# OXYGEN DEMAND, BIOCHEMICAL

QUALITY CONTROL DATA FROM 04/01/95 TO 29/12/95

Laboratory Unit: BOD

Full Scale: to 9.0 mg/L as O at 20°C

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	128	0.00	0.015	0.015	0.0898
B:	128	0.00	0.026	0.026	0.0828

On any given day the calibration is accepted if the values obtained lie within the ranges:

-0.25 - 0.25

## RECOVERIES:

Number of Data	Expected Depletion	Mean Depletion	Standard Deviation (1)
64	2.20	2.10	0.1965
64	4.34	4.25	0.3079
64	6.52	6.38	0.3622

## DUPLICATES:

n Data Pairs	Sample Depletion Span	Standard Deviation (2)	Coefficient of variation(%)
27	0.0 - 1.8	0.0946	8.9
20	1.9 - 4.5	0.1770	10.9
15	4.6 - 9.0	0.1535	3.4
62	Overall	0.1222	

## OTHER CHECKS:

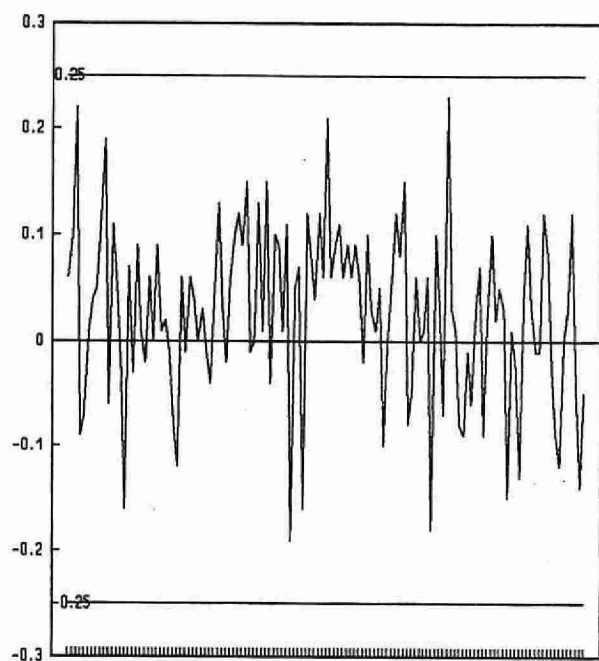
	n	Mean	Standard Deviation (1)
5 Day Pure-DW Blank	65	0.101	0.0928
5 Day BOD Blank	65	0.108	0.0963

## NOTES:

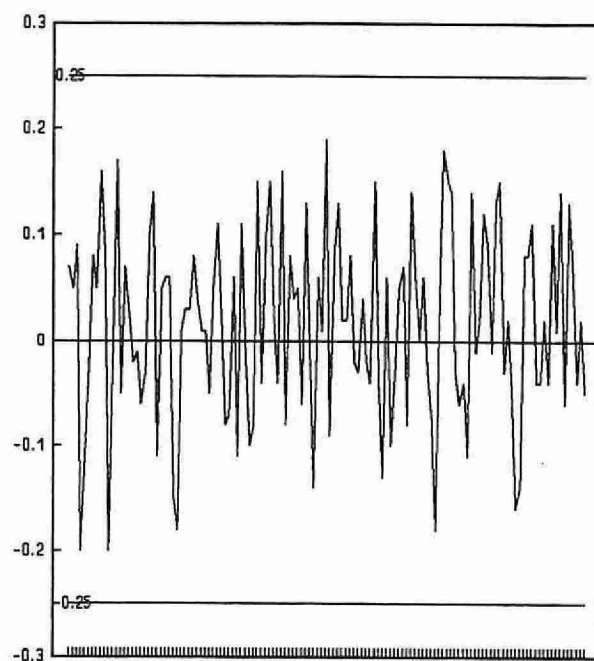
The final concentration of BOD in mg/L as O is determined by the oxygen depletion after 5 days at 20°C multiplied by a dilution and seed correction factor.

OXYGEN DEMAND, BIOCHEMICAL (mg/L as O)

QUALITY CONTROL DATA FROM 04/01/95 TO 29/12/95



QUALITY CONTROL STANDARD A



QUALITY CONTROL STANDARD B

CONTROL LIMIT

## OXYGEN DEMAND, CHEMICAL

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/07/82
Method Reference No	E3170A	Units	mg/L as O
LIMS Product Code	COD3170	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents		

### SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples (10.0 mL) are mixed with an acidified potassium dichromate solution which contains mercuric sulphate to suppress chloride interference. After adding concentrated sulphuric acid containing silver sulphate as a catalyst, the mixture is digested in a mechanical-convection oven for 3 hours at 149°C. Analysis is completed by automated colourimetric measurement of trivalent chromium. Approximate absorbance: 0.05 at the full scale level.

### INSTRUMENTATION:

- Culture tubes with Teflon closures; mechanical-convection oven
- Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 600 nm.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 1	Current T value: 5
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### CALIBRATION:

3 digested BL plus 3 digested standards

### CONTROLS:

Calibration	2 digested standards, e.g. QCA
Drift	Undigested BL every 10 samples; standard plus BL at end of run
Recovery	2 digested standards, e.g. R1
Interference	Digested standard (40 mg/L as O) spiked with 50 mg/L Cl confirms suppression of chloride interference.

### NOTES:

In order to retard sample decomposition the first reagent (acidified dichromate) is added as soon as possible at the laboratory. Analysis is scheduled for completion within the week. The recovery standard is a material known to be very difficult to digest. The expected recovery is approximately 85%, based on long term experience. We continue to use this material in spite of the poor recovery, because if the slightest problem exists with the digestion step, the recovery falls off sharply to approximately 10%.

# OXYGEN DEMAND, CHEMICAL

QUALITY CONTROL DATA FROM 07/01/95 TO 23/12/95

Laboratory Unit: Colourimetry

Full Scale: to 40.0 mg/L as O

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	40	40.0	40.16	0.16	1.2624
B:	40	10.0	9.96	-0.04	1.3648
A+B:	40	50.0	50.18	0.18	1.6554
A-B:	40	30.0	30.23	0.23	2.0253

s.d.(AB)

S(between runs): 1.31

Sw(within run): 1.43

S/Sw: 0.9

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

46.3 - 53.7 for A+B

27.2 - 32.8 for A-B

## RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
40	39	37.03	1.9458
40	9.8	9.64	1.3660

## DUPLICATES:

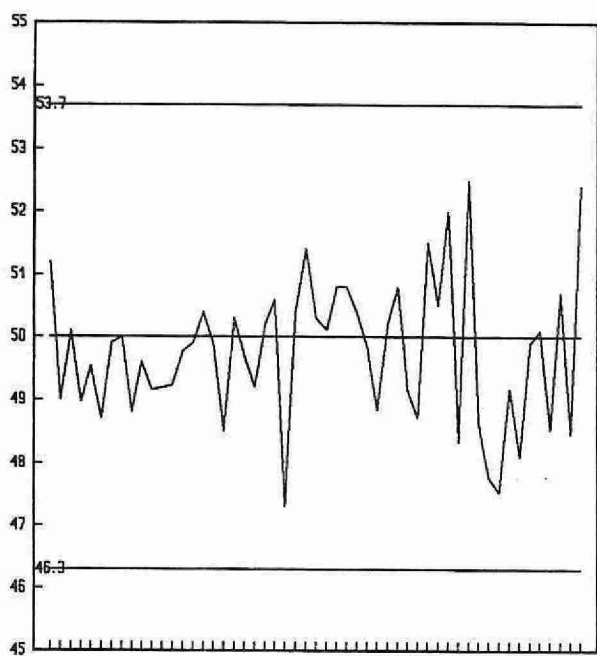
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
17	0 - 8	2.1941	36.4
44	9 - 20	2.2128	16.4
31	21 - 40	1.9922	6.7
92	Overall	2.1335	

## OTHER CHECKS:

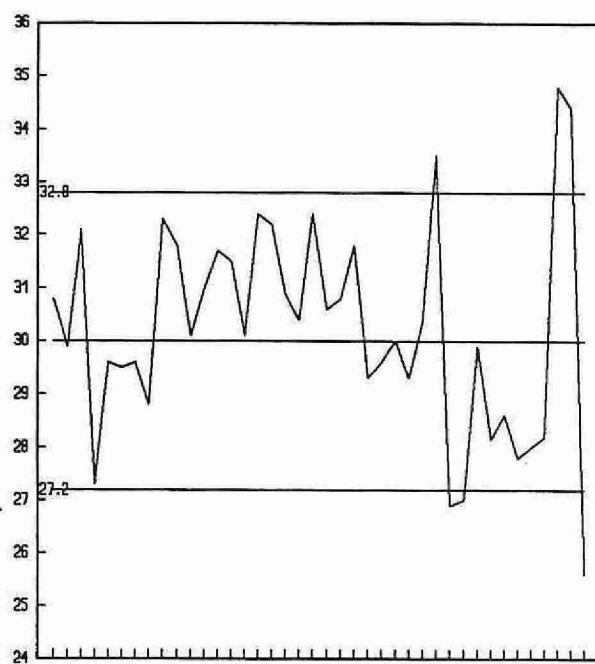
	n	Mean	Standard Deviation (1)
Chloride Check	40	39.11	2.0972

OXYGEN DEMAND, CHEMICAL (mg/L as O)

QUALITY CONTROL DATA FROM 07/01/95 TO 23/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## OXYGEN DEMAND, CHEMICAL

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/07/82
Method Reference No	E3246A	Units	mg/L as O
LIMS Product Code	COD3246	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Domestic Waters, Leachates, Effluents		

### SAMPLING:

Quantity Required	25 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples (10.0 mL) are mixed with an acidified potassium dichromate solution which contains mercuric sulphate to suppress chloride interference. After adding concentrated sulphuric acid containing silver sulphate as a catalyst, the mixture is digested in a mechanical-convection oven for 3 hours at 149°C. Analysis is completed by automated colourimetric measurement of trivalent chromium. Approximate absorbance: 0.6 at the full scale level.

### INSTRUMENTATION:

-Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 600 nm.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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### CALIBRATION:

2 digested BL plus 4 digested standards

### CONTROLS:

Calibration	2 digested standards, e.g. QCA
Drift	Undigested BL every 10 samples; standard plus BL at end of run
Recovery	2 digested standards, e.g. R1
Interference	Digested standard (50 mg/L as O) spiked with 900 mg/L Cl confirms suppression of chloride interference.

### NOTES:

In order to retard sample decomposition the first reagent (acidified dichromate) is added as soon as possible at the laboratory. Analysis is scheduled for completion within the week. The recovery standard is a material known to be very difficult to digest. The expected recovery is approximately 85%, based on long term experience. We continue to use this material in spite of the poor recovery, because if the slightest problem exists with the digestion step, the recovery falls off sharply to approximately 10%.

# OXYGEN DEMAND, CHEMICAL

QUALITY CONTROL DATA FROM 17/01/95 TO 23/12/95

Laboratory Unit: Colourimetry

Full Scale: to 500.0 mg/L as O

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	43	400	398.2	-1.8	4.9332
B:	43	100	102.5	2.5	5.5121
A+B:	43	500	500.8	0.8	7.1610
A-B:	43	300	295.5	-4.5	7.5868

s.d.(AB) S(between runs): 5.23

Sw(within run): 5.4

S/Sw: 0.97

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

477.5 - 522.5 for A+B

285.0 - 315.0 for A-B

## RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
42	390	385.9	9.6137
42	98	100.5	6.7881

## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
48	0 - 50	4.4861	20.7
16	51 - 100	2.9879	3.7
15	101 - 250	4.4569	3.0
12	251 - 500	6.3085	1.7
91	Overall	4.4550	

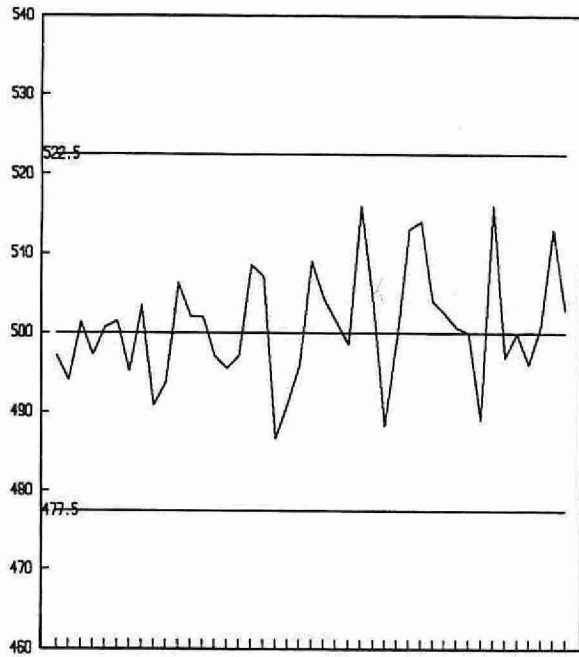
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Chloride Check	42	54.6	8.5689

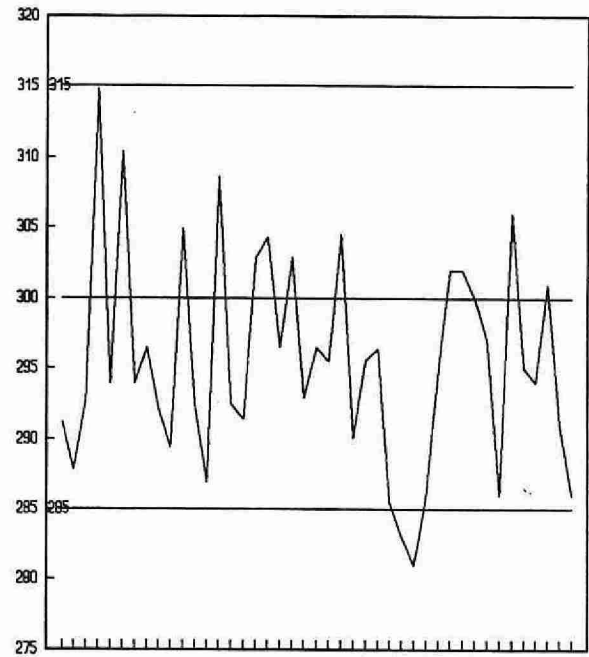


OXYGEN DEMAND, CHEMICAL (mg/L as O)

QUALITY CONTROL DATA FROM 17/01/95 TO 23/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## pH

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/01/76
Method Reference No.	E3042A	Units	dimensionless
LIMS Product Code	PHALK3042	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation, and Groundwaters		

### SAMPLING:

Quantity Required:	150 mL
Container:	250 mL Amber polyethylene or BOD bottle filled to the brim; screw caps with cone-shaped liners are preferred.

### ANALYTICAL PROCEDURE:

pH is measured directly on a stirred sample (100 mL) at room temperature. Stirring rate, beaker size, degree of electrode immersion and room temperature range are uniform for all samples and standards. Alkalinity (Gran) is performed simultaneously.

### INSTRUMENTATION:

Digital pH meter, stirrer, combined glass electrode.

### REPORTING:

Maximum Significant Figures: 3

### CALIBRATION:

2 standard buffers covering the pH range of 4 to 7

### CONTROLS:

Calibration	BL plus 2 standards, e.g. QCA
Drift	2 standard buffers - 2 times daily

# pH

QUALITY CONTROL DATA FROM 04/01/95 TO 22/12/95

Laboratory : Dorset

Analytical Range: to 14.00 Dimensionless

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	130	6.86	6.863	0.003	0.0123
B:	130	4.01	4.009	-0.001	0.0149
A+B:	130	10.87	10.872	0.002	0.0220
A-B:	130	2.85	2.854	0.004	0.0163

s.d.(AB)

S(between runs): 0.014

S/Sw:(within run): 0.012

S/Sw: 1.2

On any given day the calibration is accepted if the values obtained lie within the ranges:

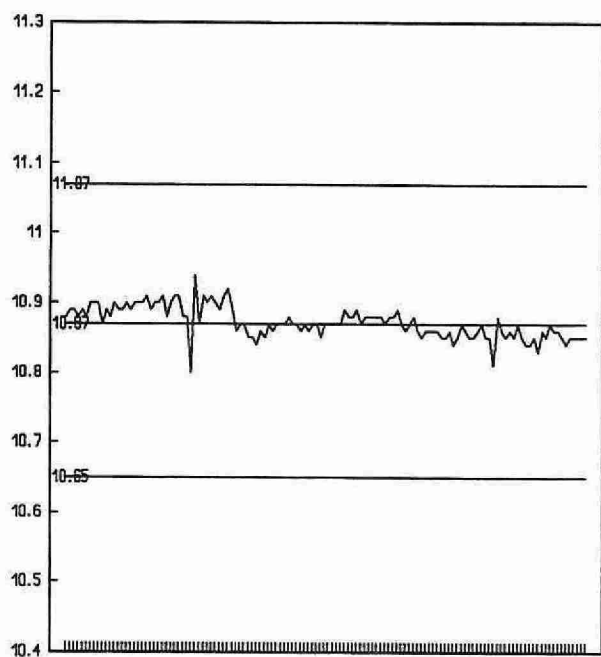
10.65 - 11.07 for A+B  
2.72 - 3.00 for A-B

## DUPLICATES:

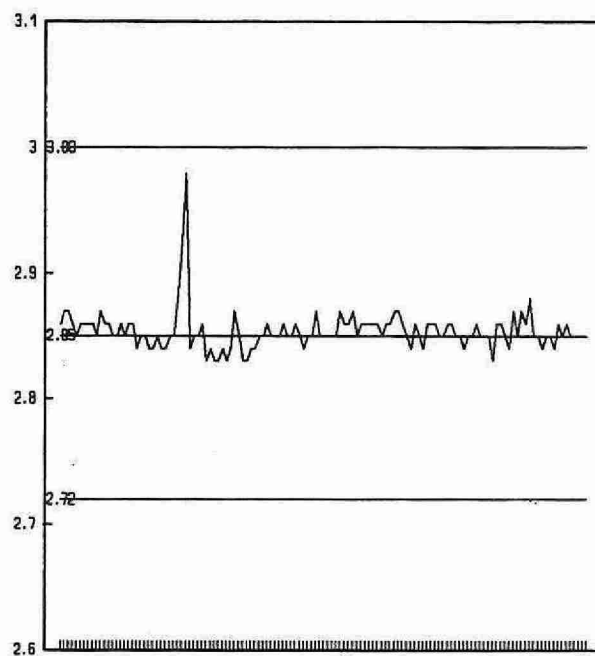
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
71	3.5 - 5.00	0.0127	0.4
80	5.01 - 6.00	0.0284	0.5
122	6.01 - 7.00	0.0335	0.8
101	7.01 - 9.00	0.0305	1.0
374	Overall	0.0277	

pH

QUALITY CONTROL DATA FROM 04/01/95 TO 22/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## pH

### IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	09/07/80
Method Reference No	E3218A	Units	Dimensionless
LIMS Product Code	PHALCO3218, CONDPH3218	Supervisor	F. Lo
Sample Type/Matrix	Domestic Waters, Sewage, Effluents		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (10.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards. Total fixed endpoint alkalinity, and conductivity are determined simultaneously.

### INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3

### CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

### CONTROLS:

Calibration	2 QC standards e.g. QCA
Drift	In run standards throughout the run (diluted tap water 50% V/V)

# pH

QUALITY CONTROL DATA FROM 05/01/95 TO 29/12/95

Laboratory Unit: Titration

Analytical Range: to 14.00 Dimensionless

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	105	7.41	7.415	0.005	0.0126
B:	105	4.45	4.48	0.03	0.0405
A+B:	105	11.86	11.90	0.04	0.0453
A-B:	105	2.96	2.93	-0.03	0.0392

s.d.(AB)      S(between runs): 0.030      Sw(within run): 0.028      S/Sw: 1.1

On any given day the calibration is accepted if the values obtained lie within the ranges:

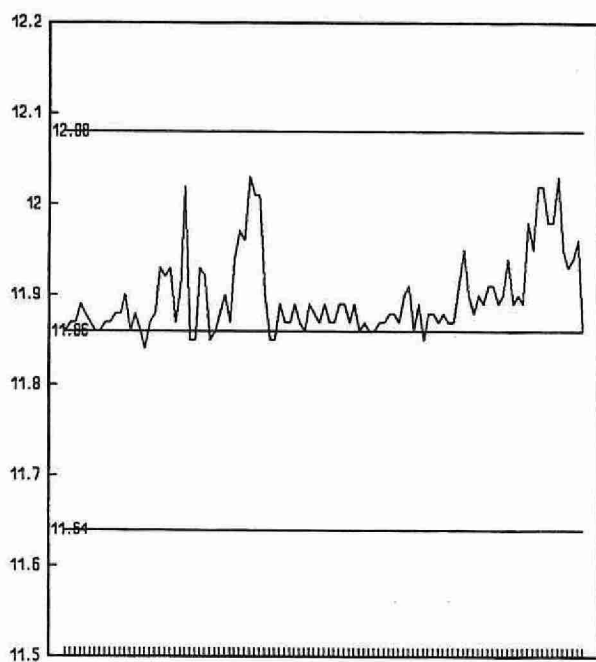
11.64 - 12.08 for A+B  
2.79 - 3.13 for A-B

## DUPLICATES:

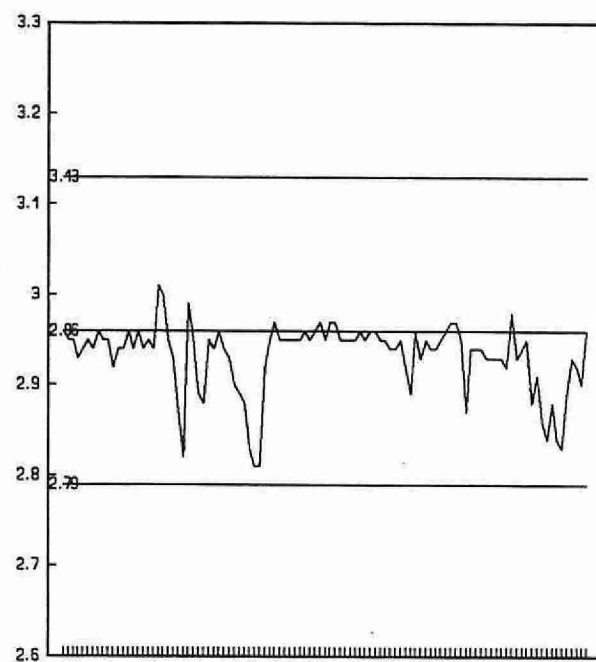
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
16	1.00 - 7.00	0.1795	2.8
149	7.01 - 8.00	0.1486	1.9
82	8.01 - 12.00	0.1094	1.1
247	Overall	0.1272	

pH

QUALITY CONTROL DATA FROM 05/01/95 TO 29/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## pH

### IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	before '70
Method Reference No	E3228A	Units	Dimensionless
LIMS Product Code	PHALK3228, PH3228	Supervisor	F. Lo
Sample Type/Matrix	Landfill leachates		

### SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (15.0 mL) at room temperature. Stirring rate and room temperature range are uniform for all samples and standards.

### INSTRUMENTATION:

pH meter, stirrer, Radiometer combination electrode.

### REPORTING:

Maximum Significant Figures: 3

### CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

### CONTROLS:

Calibration	2 QC standards e.g. QCA
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# pH

QUALITY CONTROL DATA FROM 24/01/95 TO 01/12/95

Laboratory Unit: Titration

Analytical Range: to 14.00 Dimensionless

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	25	7.41	7.40	-0.01	0.0203
B:	25	4.45	4.47	0.02	0.0419
A+B:	25	11.86	11.87	0.01	0.0571
A-B:	25	2.96	2.93	-0.03	0.0329

s.d.(AB) S(between runs): 0.033

Sw(within run): 0.023

S/Sw: 1.4

On any given day the calibration is accepted if the values obtained lie within the ranges:

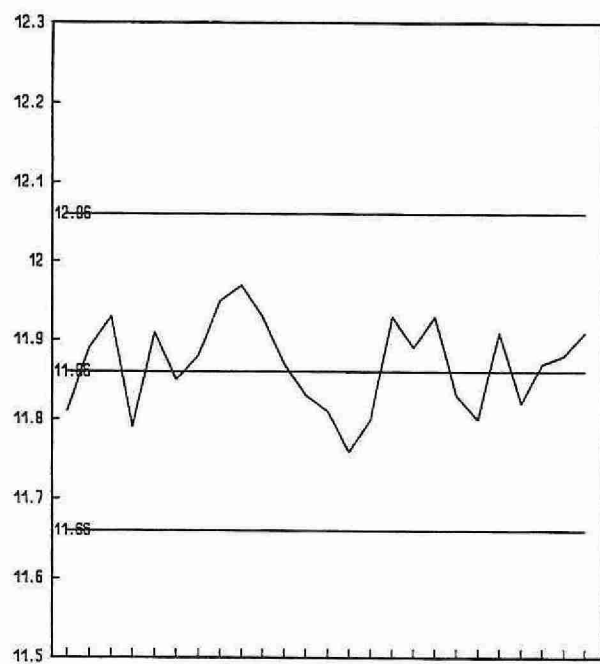
11.66 - 12.06 for A+B  
2.81 - 3.11 for A-B

## DUPLICATES:

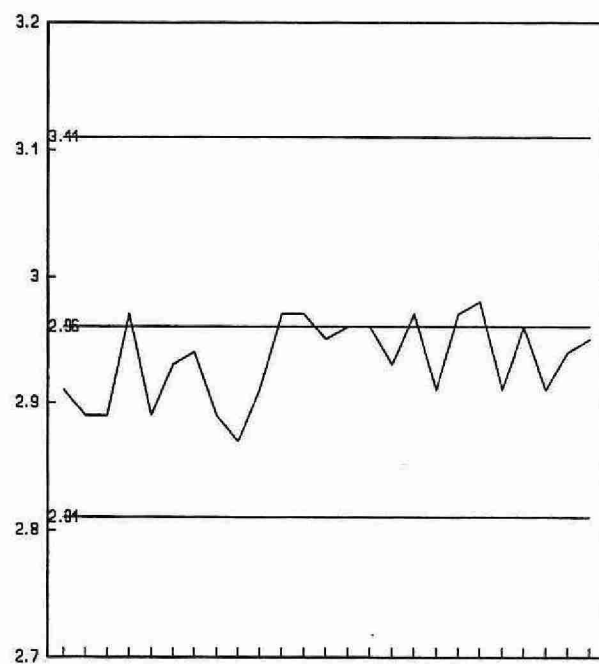
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
53	4.00 - 8.00	0.0431	2.7
8	8.01 - 8.50	0.0144	0.2
3	8.51 - 14.00	0.0532	0.8
64	Overall	0.0382	

pH

QUALITY CONTROL DATA FROM 24/01/95 TO 01/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## pH

### IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	01/05/79
Method Reference No	E3248A	Units	Dimensionless
LIMS Product Code	PHACD3248,PH3248	Supervisor	F. Lo
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

### SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (10.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards. Total fixed endpoint acidity and Gran acidity are determined simultaneously.

### INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3

### CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
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# pH

QUALITY CONTROL DATA FROM 04/01/95 TO 20/10/95

Laboratory Unit: Titration

Analytical Range: to 14.00 Dimensionless

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	17	4.45	4.458	0.008	0.0130
B:	17	3.75	3.741	-0.009	0.0152
A+B:	17	8.20	8.198	-0.002	0.0258
A-B:	17	0.70	0.717	0.017	0.0116

s.d.(AB)

S(between runs): 0.014

S/Sw:(within run): 0.008

S/Sw: 1.7

On any given day the calibration is accepted if the values obtained lie within the ranges:

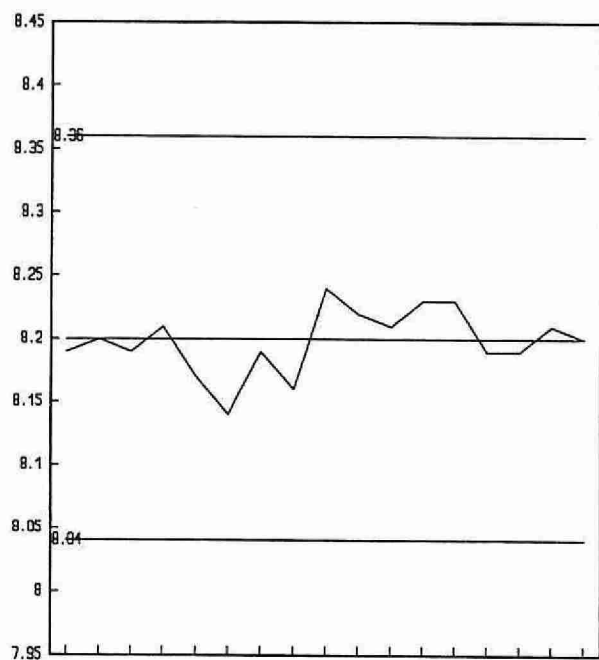
8.04 - 8.36 for A+B  
0.59 - 0.81 for A-B

## DUPLICATES:

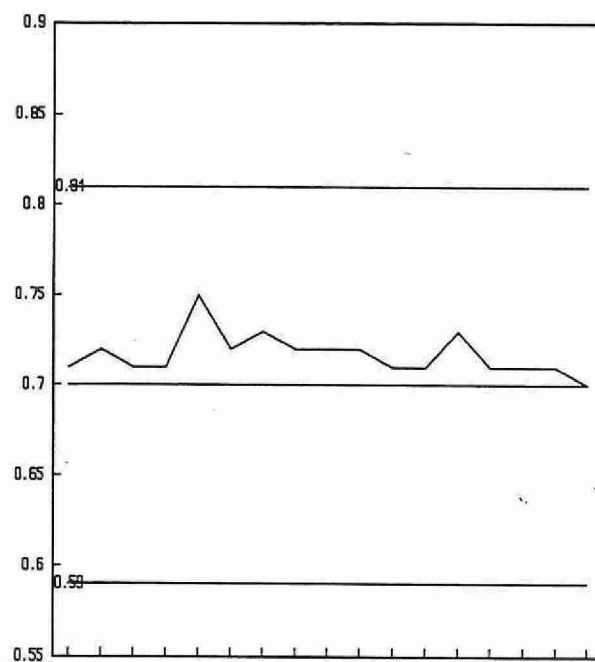
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
37	3.00 - 5.00	0.0146	0.4
5	5.01 - 8.50	0.0612	1.4
0	8.51 - 14.0	N.A.	N.A.
42	Overall	0.0169	

pH

QUALITY CONTROL DATA FROM 04/01/95 TO 20/10/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## pH

### IDENTIFICATION:

Laboratory Unit	Titration	Method Introduced	09/07/80
Method Reference No	E3289A	Units	Dimensionless
LIMS Product Code	PHALCO3289, CONDPH3289	Supervisor	F. Lo
Sample Type/Matrix	Rivers, Lakes		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

pH is directly measured on a stirred sample (10.0 mL) at room temperature. Stirring rate, tube size, degree of electrode immersion, and room temperature range are uniform for all samples and standards. Gran Alkalinity, total fixed endpoint alkalinity, and conductivity are determined simultaneously.

### INSTRUMENTATION:

Automated modular titration system with microcomputer control and data processing software.

### REPORTING:

Maximum Significant Figures: 3

### CALIBRATION:

2 standard buffers covering the pH range of 4 to 9

### CONTROLS:

Calibration	2 QC standards e.g. QCA
Drift	In run standards throughout the run (diluted tap water 20% V/V)

pH

QUALITY CONTROL DATA FROM 03/01/95 TO 27/12/95

Laboratory Unit: Titration

Analytical Range: to 14.00 Dimensionless

CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	96	7.41	7.41	0.00	0.0153
B:	96	4.45	4.48	0.03	0.0435
A+B:	96	11.86	11.89	0.03	0.0466
A-B:	96	2.96	2.92	-0.04	0.0456

s.d.(AB)

S(between runs): 0.03

S/Sw:(within run): 0.03

S/Sw: 1.0

On any given day the calibration is accepted if the values obtained lie within the ranges:

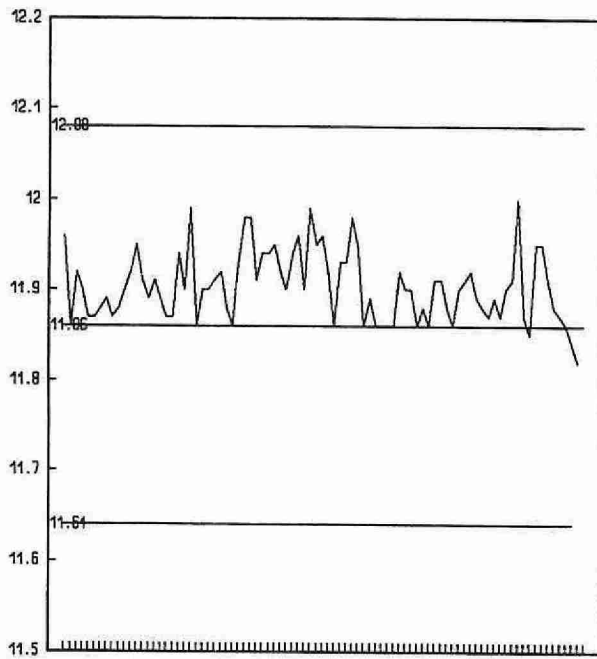
11.64 - 12.08 for A+B  
2.79 - 3.13 for A-B

DUPLICATES:

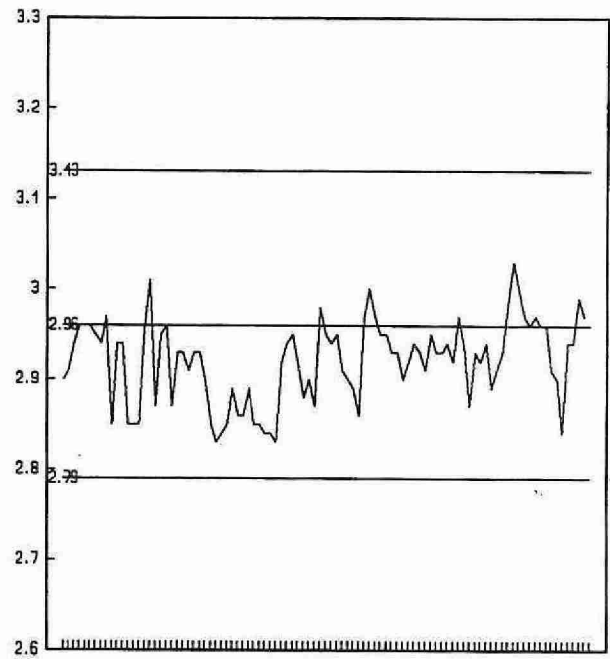
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
21	4.00 - 7.50	0.0700	1.1
48	7.51 - 8.00	0.1332	1.9
204	8.01 - 9.00	0.0688	0.8
273	Overall	0.0783	

pH

QUALITY CONTROL DATA FROM 03/01/95 TO 27/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT



## PHENOLICS, REACTIVE

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/74
Method Reference No	E3179A	Units	µg/L as Phenol
LIMS Product Code	PHEN3179	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents, Domestic Water Supplies, Leachates, Sewage, Industrial Wastes		

### SAMPLING:

Quantity Required	250 mL
Container	Glass, (Phenol bottle with white cap containing preservative is available)
Preservative	Sulfuric acid to pH 1.5 - 2

### ANALYTICAL PROCEDURE:

Samples are automatically distilled from an acid media, and reactive phenolics in the distillate are determined colourimetrically by formation of an antipyrene dye through reactions with 4-aminoantipyrene and potassium ferricyanide.

Approximate absorbance: 0.03 at the full scale level.

### INSTRUMENTATION:

Basic automated modular continuous flow system plus a distillation module. Colourimetric measurement is through a 5.0 cm. light path at 505 nm.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

BL plus 2 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	BL, standard, BL every 10 samples

# PHENOLICS, REACTIVE

QUALITY CONTROL DATA FROM 06/01/95 TO 29/12/95

Laboratory Unit: Colourimetry

Full Scale: to 50.0 µg/L as Phenol

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	64	40	40.30	0.30	0.7054
B:	64	10	10.21	0.21	0.2465
A+B:	64	50	50.53	0.53	0.7698
A-B:	64	30	30.12	0.12	0.6778

s.d.(AB)

S(between runs): 0.53

Sw(within run): 0.48

S/Sw: 1.10

On any given day the calibration is accepted if the calibration control values obtained lie within the ranges:

47.8 - 52.2 for A+B  
28.5 - 31.5 for A-B

## DUPLICATES:

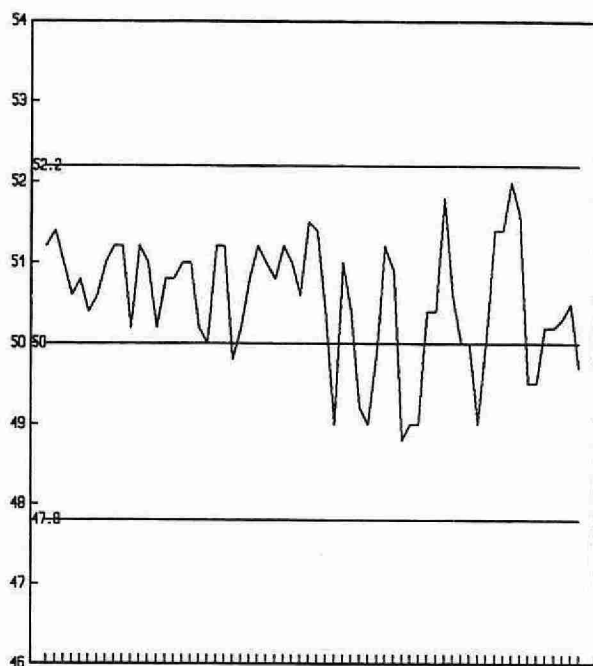
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
175	0.00 - 5.0	0.1134	26.6
6	5.1 - 10.0	0.4153	4.6
3	10.1 - 25.0	0.6363	3.9
1	25.1 - 50.0	N.A.	N.A.
185	Overall	0.1493	

## OTHER CHECKS:

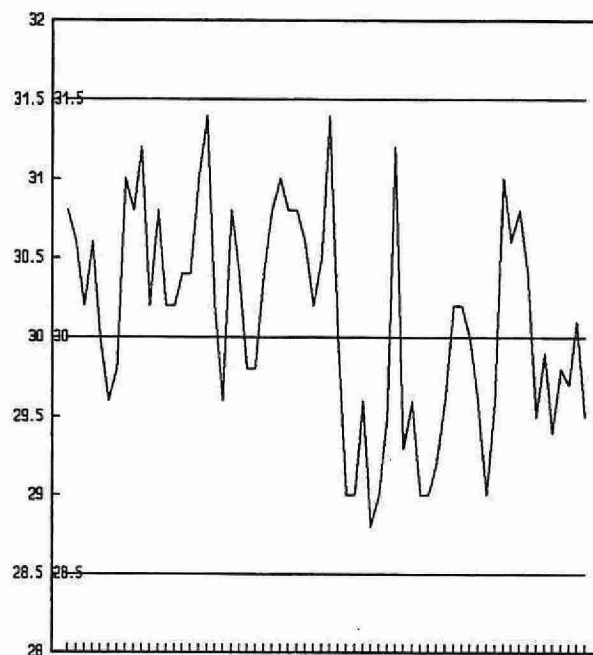
	n	Mean	Standard Deviation (1)
Long Term Blank	64	0.225	0.1155

PHENOLICS, REACTIVE ( $\mu\text{g/L}$  as Phenol)

QUALITY CONTROL DATA FROM 06/01/95 TO 29/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

\_\_\_\_\_ CONTROL LIMIT

## PHOSPHORUS, REACTIVE ortho-PHOSPHATE

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3364A	Units	mg/L as P
LIMS Product Code	DISNUT3364	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Ortho-phosphate is determined on the supernatant of a settled sample by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.2 at the full scale level.

Ammonia plus ammonium, nitrite, and nitrate plus nitrite are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using IR sensitive phototube.

Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.0005	Current T value: 0.0025
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

### NOTES:

Sept.'94 the method codes RNDNP-E3174A, E3175A, E3208A and E3266 were amalgamated and a new method code RNDNP-E3364A was generated.

# PHOSPHORUS, REACTIVE ortho-PHOSPHATE

QUALITY CONTROL DATA FROM 04/01/95 TO 14/12/95

Laboratory Unit: Colourimetry

Full Scale: to 0.100 mg/L as P

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	90	0.080	0.0799	-0.0001	0.0010
B:	90	0.040	0.0401	0.0001	0.0007
C:	90	0.008	0.0082	0.0002	0.0007
A+B:	90	0.120	0.1200	0.0000	0.0014
A-B:	90	0.040	0.0398	-0.0002	0.0011
B+C:	90	0.048	0.0483	0.0003	0.0012
B-C:	90	0.032	0.0319	-0.0001	0.0007

s.d.(AB) S(between runs): 0.0009

Sw(within run): 0.0008

S/Sw: 1.2

s.d.(BC) S(between runs): 0.0007

Sw(within run): 0.0005

S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.1152 - 0.1248 for A+B  
0.0364 - 0.0436 for A-B  
0.0448 - 0.0512 for B+C  
0.0296 - 0.0344 for B-C

## DUPLICATES:

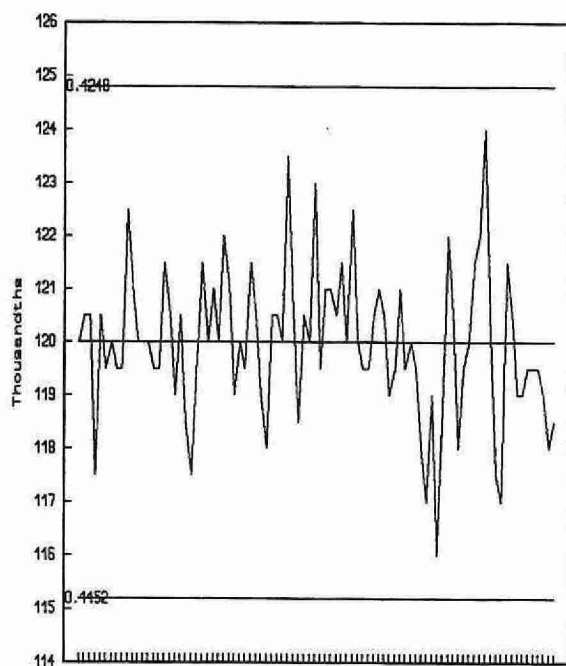
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
203	0.000 - 0.010	0.00090	127.6
25	0.011 - 0.020	0.00176	27.9
25	0.021 - 0.050	0.02862	18.1
9	0.051 - 0.100	0.00271	26.7
262	Overall	0.00117	

## OTHER CHECKS:

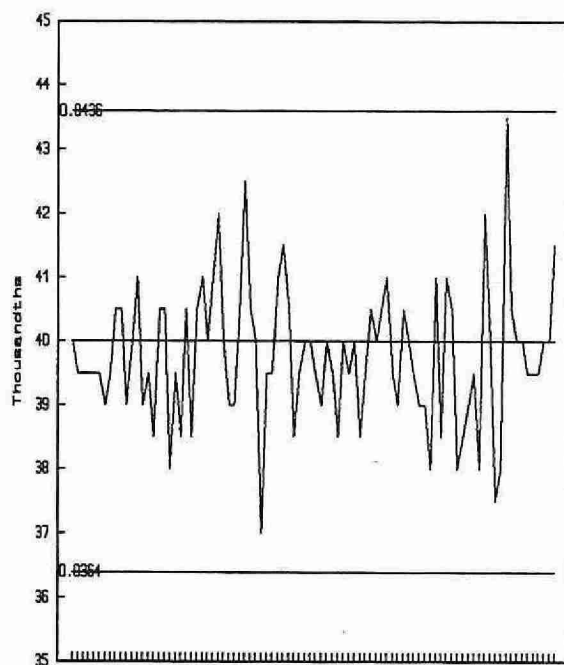
	n	Mean	Standard Deviation (1)
Long Term Blank	90	-0.000002	0.00058

PHOSPHORUS, REACTIVE ortho-PHOSPHATE (mg/L as P)

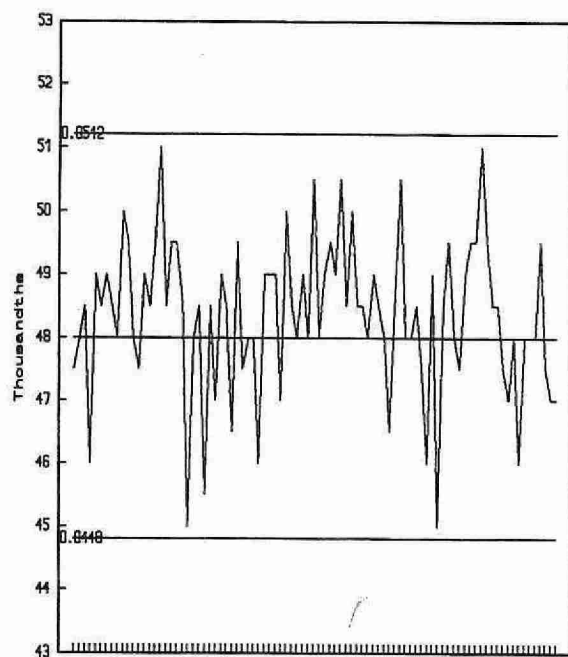
QUALITY CONTROL DATA FROM 04/01/95 TO 14/12/95



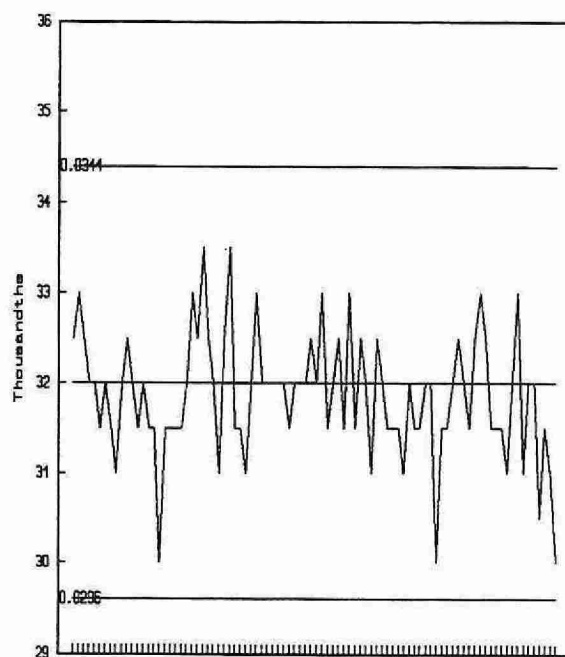
QUALITY CONTROL SAMPLE A+B



QUALITY CONTROL SAMPLE A-B



QUALITY CONTROL SAMPLE B+C



QUALITY CONTROL SAMPLE B-C

CONTROL LIMIT

## PHOSPHORUS, REACTIVE ortho-PHOSPHATE

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3366A	Units	mg/L as P
LIMS Product Code	DISNUT3366	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Domestic Waters, Effluents		

### SAMPLING:

Quantity Required	10 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Ortho-phosphate is determined on the supernatant of a settled sample by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.5 at the full scale level.

Ammonia plus ammonium, nitrite, and nitrate plus nitrite are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using IR sensitive phototube.

Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.1
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; standard every 20 samples

### NOTES:

Sept.'94 the method codes SDNP-E3223A, E3193A, E3184A and E3185 were amalgamated and a new method code SDNP-E3366A was generated.

# PHOSPHORUS, REACTIVE ortho-PHOSPHATE

QUALITY CONTROL DATA FROM 03/01/95 TO 13/12/95

Laboratory Unit: Colourimetry

Full Scale: to 10.0 mg/L as P

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	94	8.00	7.993	-0.007	0.0373
B:	94	4.00	3.991	-0.009	0.0192
C:	94	0.800	0.805	0.005	0.0102
A+B:	94	12.0	11.98	-0.02	0.0461
A-B:	94	4.00	4.002	0.002	0.0372
B+C:	94	4.80	4.796	-0.004	0.0245
B-C:	94	3.20	3.186	-0.004	0.0185

s.d.(AB) S(between runs): 0.030

Sw(within run): 0.026

S/Sw: 1.1

s.d.(BC) S(between runs): 0.015

Sw(within run): 0.013

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

11.71	-	12.29	for	A+B
3.78	-	4.22	for	A-B
4.66	-	4.94	for	B+C
3.09	-	3.31	for	B-C

## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
250	0.000 - 1.00	0.0111	23.5
11	1.01 - 2.00	0.0318	1.8
12	2.01 - 5.00	0.0575	1.6
5	5.01 - 10.0	0.0688	1.0
278	Overall	0.0130	

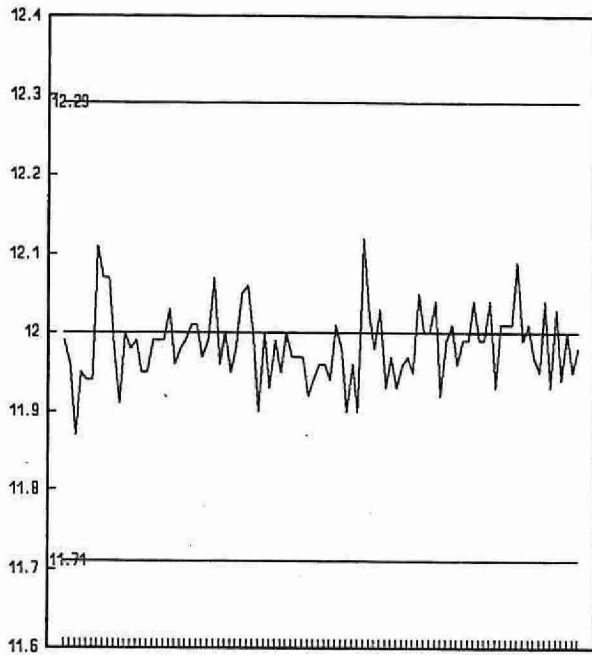
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	94	-0.00021	0.0078

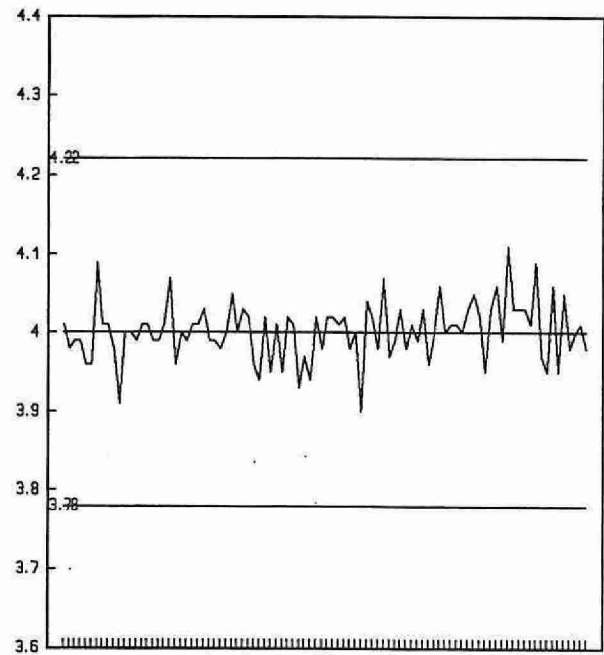


PHOSPHORUS, REACTIVE ortho-PHOSPHATE (mg/L as P)

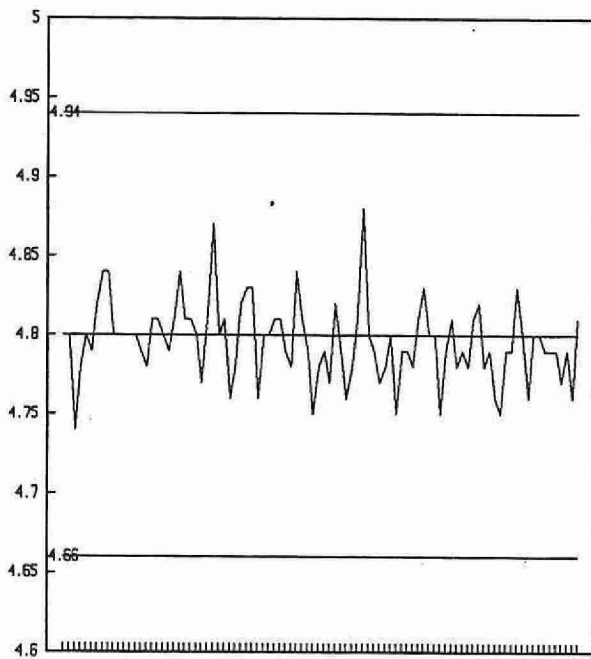
QUALITY CONTROL DATA FROM 03/01/95 TO 13/12/95



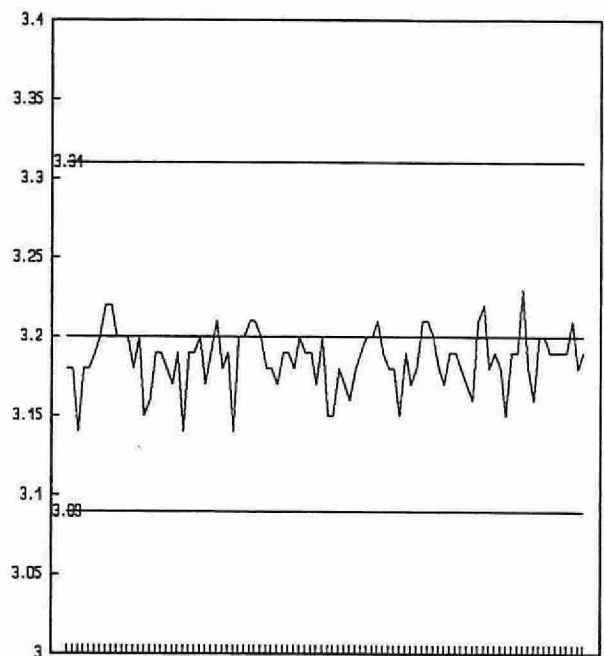
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B-C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## PHOSPHORUS, TOTAL

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	22/03/79
Method Reference No.	E3036A	Units	µg/L as P
LIMS Product Code	TP3036	Supervisor	J. McBride
Sample Type/Matrix:	Streams, Lakes, Precipitation		

### SAMPLING:

Quantity Required:	35 mL
Container:	Specially marked Pyrex culture tubes with Teflon-lined caps

### ANALYTICAL PROCEDURE:

After withdrawal of excess volume, digestion reagent is added and samples are autoclaved in sulphuric acid-potassium persulphate media at 121°C for 60 min. The orthophosphate content of the digestate is determined colourimetrically by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.3 at the full scale level

### INSTRUMENTATION:

Autoclave plus basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using appropriate phototube. Two analytical ranges are obtained from the output of the colourimeter.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1
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### CALIBRATION:

BL plus 9 undigested standards

### CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples and BL plus 1 undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards, e.g. R1

### NOTES:

System is calibrated with undigested standards, but sample concentrations are adjusted to reflect day's value for digested blank.

# PHOSPHORUS, TOTAL

QUALITY CONTROL DATA FROM 13/01/95 TO 22/12/95

Laboratory: Dorset

Full Scale: to 100.0 µg/L as P

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	45	45.0	44.13	-0.87	1.0015
B:	45	13.5	13.42	-0.08	0.6178
C:	45	4.5	4.46	-0.04	0.4509
A+B:	45	58.5	57.51	-0.99	1.3891
A-B:	45	31.5	30.71	-0.79	0.8632
B+C:	45	18.0	17.98	-0.02	0.9739
B-C:	45	9.0	8.96	-0.04	0.5956

s.d.(AB) S(between runs): 0.83 Sw(within run): 0.61 S/Sw: 1.3  
s.d.(BC) S(between runs): 0.54 Sw(within run): 0.42 S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

63.5 - 53.5 for A+B  
35.5 - 27.5 for A-B  
20 - 16 for B+C  
10.5 - 7.5 for B-C

## RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
81	35	35.82	0.9868
81	14	14.28	0.8603
81	7	7.12	0.8874

## DUPLICATES:

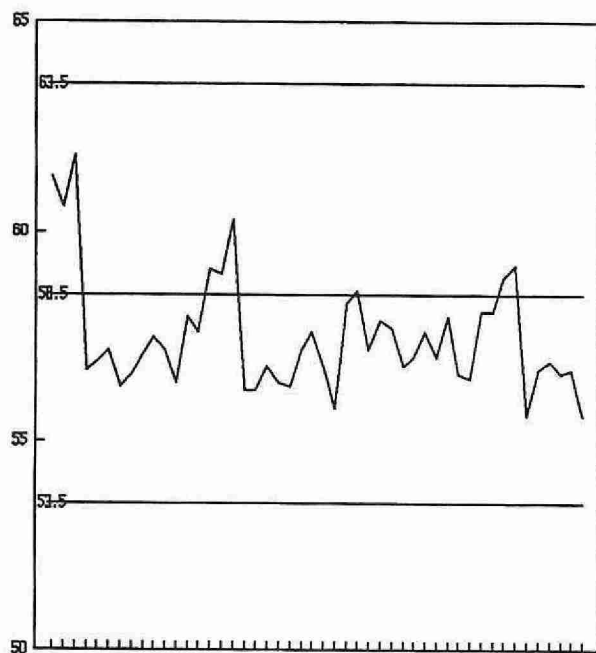
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
65	0.00 - 10.0	0.2518	8.8
27	10.1 - 20.0	0.3686	5.8
31	20.1 - 50.0	0.2429	3.1
14	50.1 - 100.0	0.3589	2.6
137	Overall	0.2758	

## OTHER CHECKS:

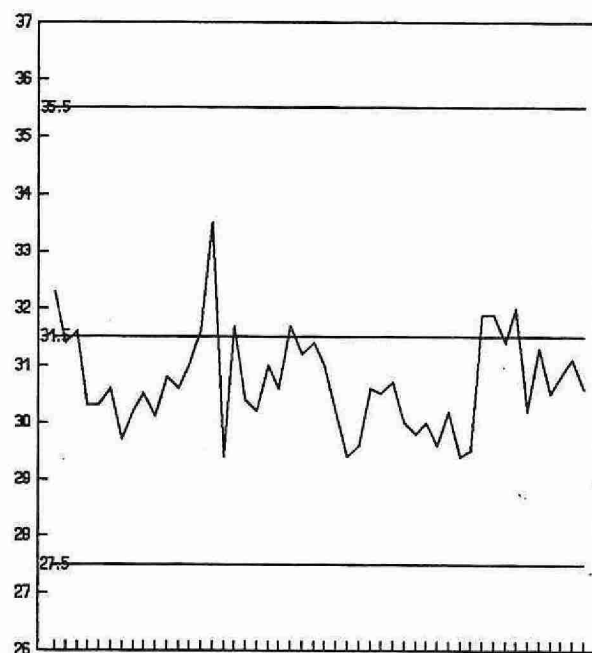
	n	Mean	Standard Deviation (1)
Long Term Blank	48	0.1	0.5513
Digested Blank	48	1.5	0.5615

# PHOSPHORUS, TOTAL ( $\mu\text{g/L}$ as P)

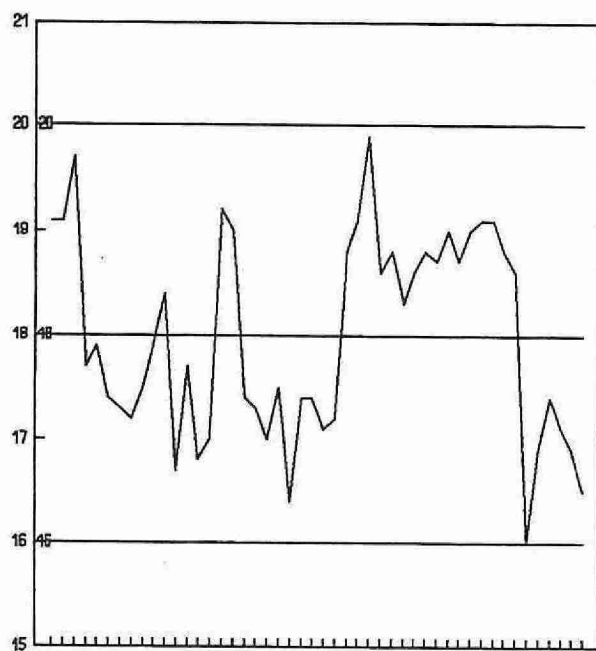
QUALITY CONTROL DATA FROM 13/01/95 TO 22/12/95



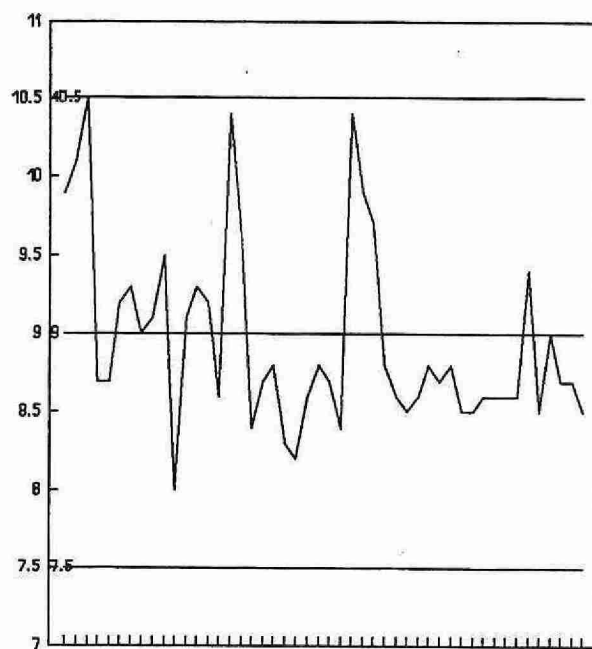
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## PHOSPHORUS, TOTAL

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	Mar '89
Method Reference No	E3116A	Units	mg/g as P
LIMS Product Code	TNP3116	Supervisor	F. Lo
Sample Type/Matrix	Soil, Sediment and Sludge		

### SAMPLING:

Quantity Required	0.08 to 0.4 g
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Phosphorus compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

### INSTRUMENTATION:

Hot plate

Basic automated modular continuous flow system : Colourimetric measurement is through a 5 cm. light path at 660 nm.

Data capture, and processing via a microcomputer system

### REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.02	Current T value: 0.10
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### CALIBRATION:

3 High and 2 Low Calibration Standards

### CONTROLS:

Calibration	In house composite B-Soil/sediment, plus QC Soils/Sediment (RS92)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

### NOTES:

System is calibrated with undigested standards.

## PHOSPHORUS, TOTAL

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95

Laboratory Unit: Colourimetry

Full Scale: 5 mg/g as P

### CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
RS92	42	0.47	0.479	0.009	0.0248

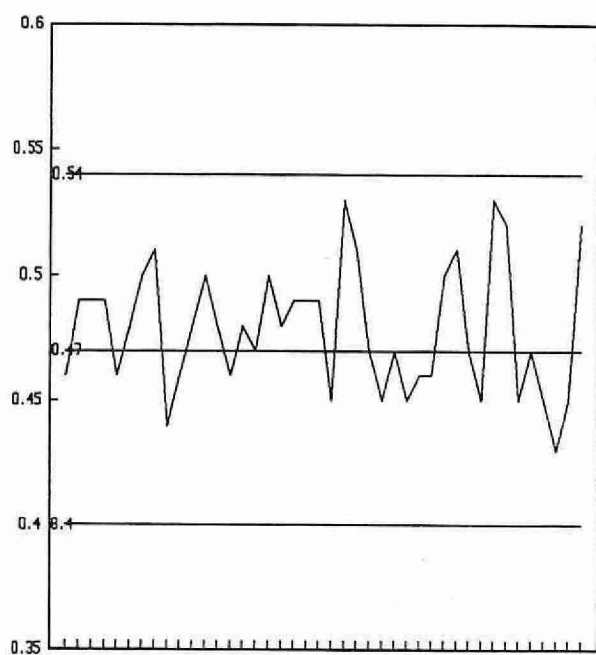
The calibration is accepted if the calibration control values obtained lie within the ranges:  
0.40 - 0.54 for RS92

### DUPLICATES: (Sediment/Soils)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
17	0.00 - 0.50	0.0280	7.7
40	0.51 - 1.00	0.0342	4.4
30	1.01 - 2.50	0.0472	3.3
1	2.51 - 5.00	N.A.	N.A
88	Overall	0.0386	

PHOSPHORUS, TOTAL (mg/g as P)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD

RS92 - Sediment and soil control

CONTROL LIMIT

## PHOSPHORUS, TOTAL

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	Mar '89
Method Reference No	E3118A	Units	mg/g as P
LIMS Product Code	TNP3118	Supervisor	F. Lo
Sample Type/Matrix	Terrestrial and aquatic vegetation		

### SAMPLING:

Quantity Required	0.02 to 0.04 g
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Phosphorus compounds are converted to simple inorganic forms by dissolution of the samples in hot sulphuric acid and potassium persulphate. Potassium persulphate is added later in the digestion to raise the boiling point and to provide a highly oxidizing environment to decompose the more resistant organic matter. The digestate is analyzed using an automated colourimetric system.

### INSTRUMENTATION:

Hot plate.

Basic automated modular continuous flow system : Colourimetric measurement is through a 5 cm. light path at 660 nm.

Data capture, and processing via a microcomputer system.

### REPORTING:

Maximum Significant Figures: 2 decimal places	Current W value: 0.02	Current T value: 0.10
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### CALIBRATION:

3 High and 2 Low Calibration Standards

### CONTROLS:

Calibration	In house composite A-VEG, plus QC VEG (Pine Needles)
Drift	4 BL's per run; high and low calibration standard at the end of the run
Recovery	1 digested BL plus 4 digested standards

### NOTES:

System is calibrated with undigested standards.



# PHOSPHORUS, TOTAL

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95

Laboratory Unit: Colourimetry

Full Scale: 8 mg/g as P

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
Pine Needles (non certified)	42	1.20	1.205	0.005	0.0396

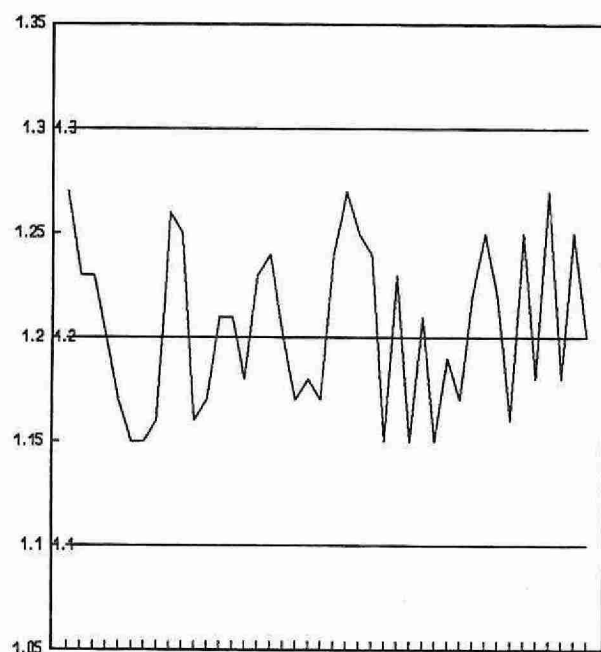
The calibration is accepted if the calibration control values obtained lie within the ranges:  
1.1 - 1.3 for Pine Needles

## DUPLICATES: (Vegetation)

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
10	0.00 - 1.60	0.0476	4.3
38	1.61 - 4.00	0.1317	5.7
40	4.01 - 8.00	0.2215	4.6
88	Overall	0.1900	

PHOSPHORUS, TOTAL (mg/g as P)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD  
Pine Needle

CONTROL LIMIT

## PHOSPHORUS, TOTAL

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3367A	Units	mg/L as P
LIMS Product Code	TOTNUT3367	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digesters kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line and then orthophosphate is determined by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.4 at the full scale level.

Total Kjeldahl nitrogen is determined simultaneously.

### INSTRUMENTATION:

Three Block digesters

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using appropriate phototube.

Data capture, reduction, and processing via a multi-stage microcomputer system

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.002	Current T value: 0.01
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### CALIBRATION:

BL plus 7 undigested standards

### CONTROLS:

Calibration	LTBL plus 3 undigested standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

# PHOSPHORUS, TOTAL

QUALITY CONTROL DATA FROM 05/01/95 TO 21/12/95

Laboratory Unit: Colourimetry

Full Scale: to 0.200 mg/L as P

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	121	0.160	0.1604	0.0004	0.0010
B:	121	0.080	0.0800	0.0000	0.0004
C:	121	0.016	0.0156	-0.0004	0.0008
A+B:	121	0.240	0.2405	0.0005	0.0011
A-B:	121	0.080	0.0804	0.0004	0.0011
B+C:	121	0.096	0.0957	-0.0003	0.0010
B-C:	121	0.064	0.0644	0.0004	0.0009

s.d.(AB) S(between runs): 0.0008 Sw(within run): 0.0008 S/Sw: 1.0  
s.d.(BC) S(between runs): 0.0007 Sw(within run): 0.0007 S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.2332 - 0.2468 for A+B  
0.0749 - 0.0851 for A-B  
0.092 - 0.100 for B+C  
0.061 - 0.067 for B-C

## RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
121	0.140	0.1385	0.0040
121	0.084	0.0839	0.0032
121	0.028	0.0282	0.0021

## DUPLICATES:

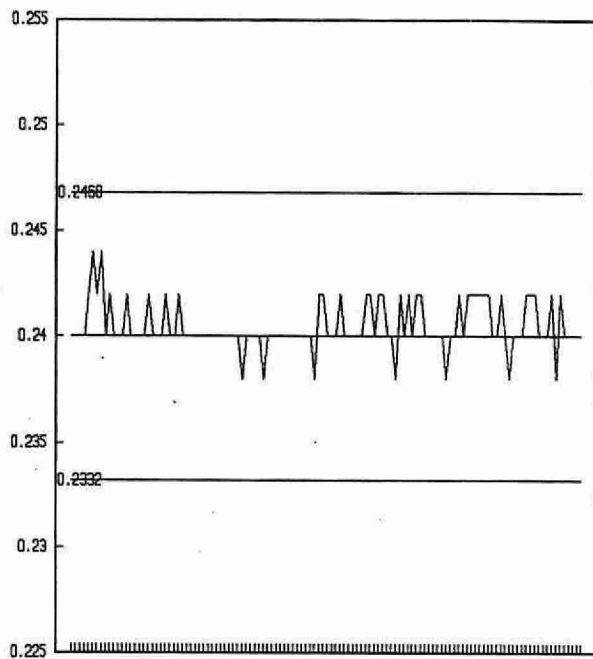
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
212	0.000 - 0.020	0.0030	31.8
60	0.021 - 0.040	0.0037	20.3
62	0.041 - 0.100	0.0043	11.7
18	0.101 - 0.200	0.0050	3.4
352	Overall	0.0034	

## OTHER CHECKS:

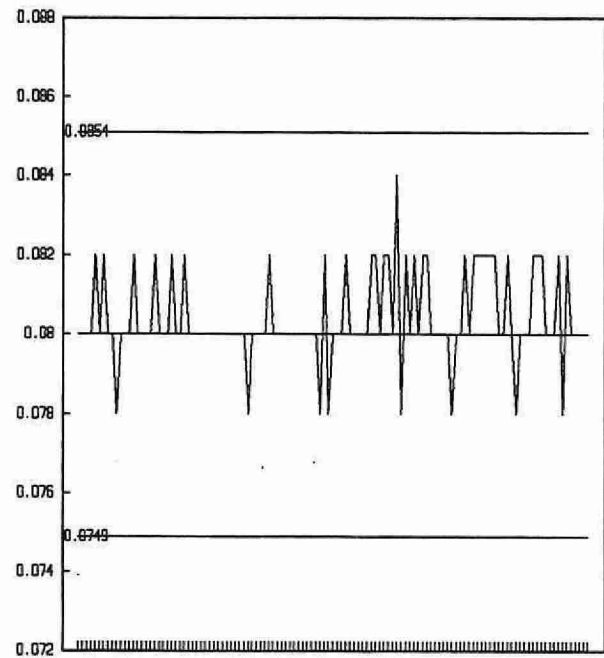
	n	Mean	Standard Deviation (1)
Long Term Blank	121	0.0002	0.0008
Digested Blank	121	0.0043	0.0021

# PHOSPHORUS, TOTAL (mg/L as P)

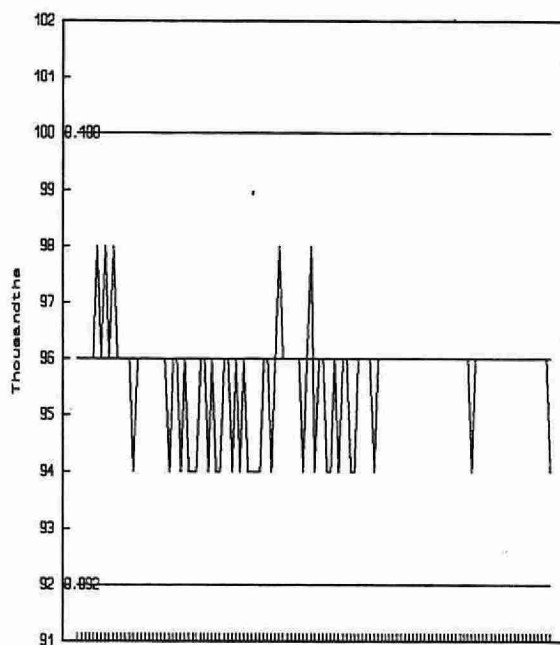
QUALITY CONTROL DATA FROM 05/01/95 TO 21/12/95



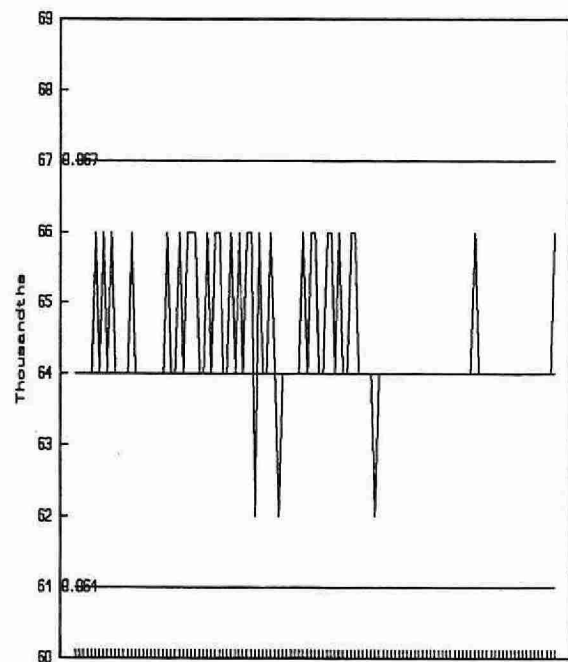
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## PHOSPHORUS, TOTAL

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/04/79
Method Reference No	E3368A	Units	mg/L as P
LIMS Product Code	TOTNUT3368	Supervisor	J. McBride
Sample Type/Matrix	Sewage, Industrial Waste, Domestic Waters, Effluents, Leachates		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using three block digestors kept at 180°C, 210°C and 360°C. The pH of the digestate is adjusted in-line and then orthophosphate is determined by formation of the reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Approximate absorbance: 0.8 at the full scale level.

Total Kjeldahl Nitrogen is determined simultaneously.

### INSTRUMENTATION:

3-Block digesters

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 880 nm using an IR sensitive phototube. Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.10
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g. QCA
Drift	BL every 10 samples; undigested standard every 20 samples
Recovery	3 digested BL plus 3 digested standards in duplicate, e.g. R1

### NOTES:

System is calibrated with undigested standards.

# PHOSPHORUS, TOTAL

QUALITY CONTROL DATA FROM 05/01/95 TO 13/12/95

Laboratory Unit: Colourimetry

Full Scale: to 10.0 mg/L as P

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	86	8.0	7.983	-0.017	0.0294
B:	86	4.0	4.001	0.001	0.0153
C:	86	0.8	0.807	0.007	0.0130
A+B:	86	12.0	11.984	-0.016	0.0355
A-B:	86	4.0	3.981	-0.019	0.0306
B+C:	86	4.8	4.809	0.009	0.0231
B-C:	86	3.2	3.194	-0.006	0.0165

s.d.(AB)

S(between runs):

0.0234

Sw(within run):

0.0216

S/Sw: 1.1

s.d.(BC)

S(between runs):

0.0142

Sw(within run):

0.0117

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

11.87	-	12.13	for	A+B
3.903	-	4.097	for	A-B
4.732	-	4.868	for	B+C
3.149	-	3.251	for	B-C

## RECOVERIES:

Number of Data	Expected Concentration	Mean Concentration	Standard Deviation (1)
86	7	6.946	0.0853
86	4.2	4.176	0.0498
86	1.4	1.397	0.0248

## DUPLICATES:

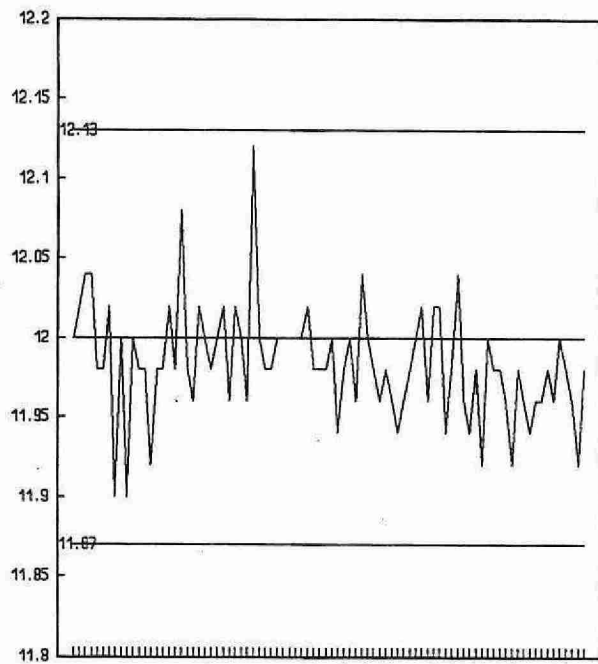
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
175	0.00 - 1.00	0.0147	40.6
18	1.00 - 2.00	0.0498	24.5
28	2.00 - 5.00	0.0869	2.4
8	5.00 - 10.00	0.0902	1.5
229	Overall	0.0237	

## OTHER CHECKS:

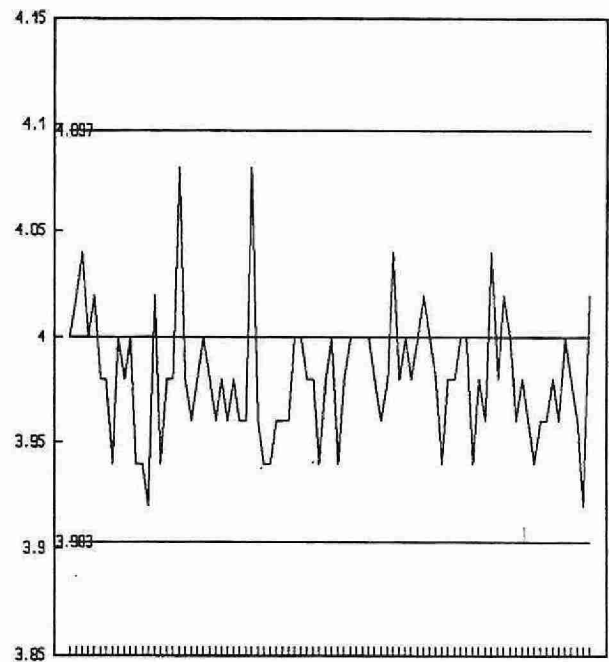
	n	Mean	Standard Deviation (1)
Long Term Blank	86	0.005	0.0122
Digested Blank	86	0.0103	0.0139

PHOSPHORUS, TOTAL (mg/L as P)

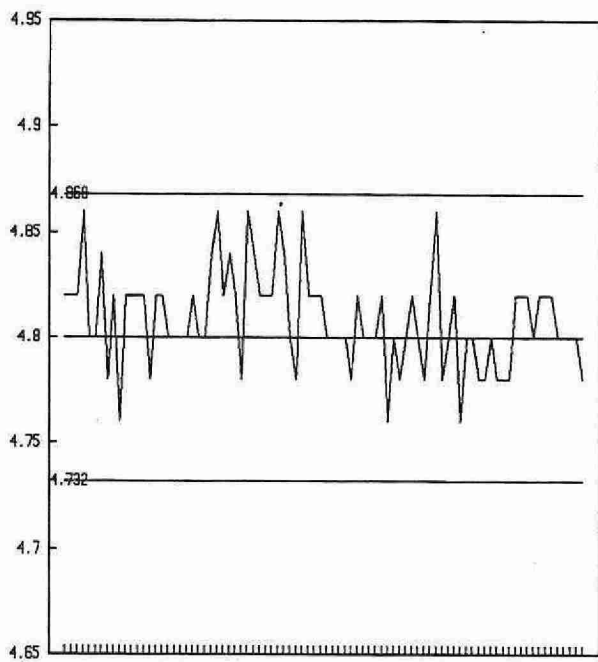
QUALITY CONTROL DATA FROM 05/01/95 TO 13/12/95



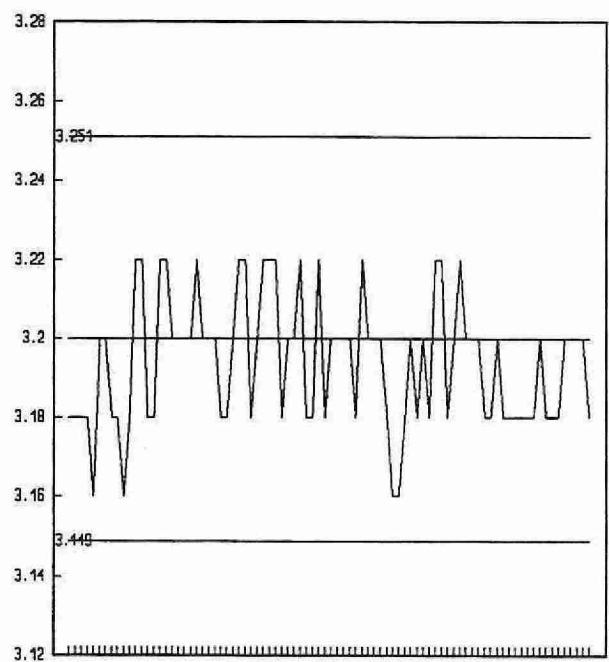
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT



## POTASSIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	18/05/79
Method Reference No.	E3146A	Units	mg/L as K, (µg/filter as K)
LIMS Product Code	CAT3146, (NAK3146)	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, (LOVOL Filter Extracts)		

### SAMPLING:

Quantity Required	5 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

### INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures	Current W value		Current T value	
3	0.002 mg/L	(0.1 µg/filter)	0.010 mg/L	(0.5 µg/filter)

### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

# POTASSIUM

QUALITY CONTROL DATA FROM 05/01/95 TO 13/10/95

Laboratory Unit: Atomic Absorption

Full Scale: to 1.00 mg/L as K

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	24	0.60	0.6017	0.0017	0.0066
B:	24	0.10	0.1019	0.0019	0.0044
A+B:	24	0.70	0.7036	0.0036	0.0084
A-B:	24	0.50	0.4998	-0.0002	0.0075

s.d.(AB) S(between runs): 0.006

Sw(within run): 0.005

S/Sw: 1.06

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.672 - 0.728 for A+B  
0.479 - 0.521 for A-B

## DUPLICATES:

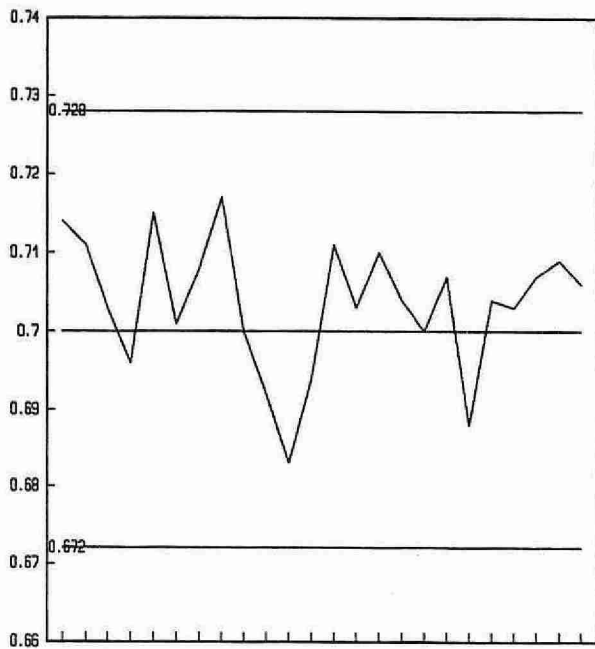
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
38	0.000 - 0.100	0.0016	30.7
4	0.101 - 0.200	0.0018	1.1
2	0.201 - 0.500	N.A.	N.A.
2	0.501 - 1.000	N.A.	N.A.
46	Overall	0.0020	

## OTHER CHECKS:

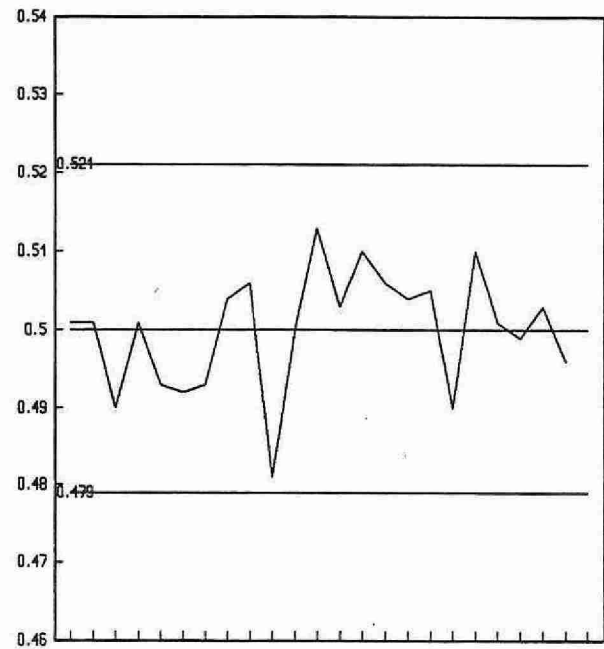
	n	Mean	Standard Deviation (1)
Long Term Blank	24	0.008	0.0344

POTASSIUM (mg/L as K)

QUALITY CONTROL DATA FROM 05/01/95 TO 13/10/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## POTASSIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	01/04/74
Method Reference No.	E3171A	Units	mg/L as K
LIMS Product Code	CAT3171,NAK3171	Supervisor	J. McBride
Sample Type/Matrix	Surface Waters, DWSP Drinking Waters		

### SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm using an air-acetylene flame. Cesium is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.923 at the full scale value.

### INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
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### CALIBRATION:

BL plus 11 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

### NOTES:

Control limits were exceeded on Aug 15,22 and Nov 18, 1994.

# POTASSIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/95

Laboratory Unit: Atomic Absorption

Full Scale: to 5.00 mg/L as K

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	123	4.00	4.03	0.03	0.0269
B:	123	1.00	1.00	0.00	0.0049
C:	123	0.25	0.25	0.00	0.0019
A+B:	123	5.00	5.03	0.03	0.0318
A-B:	123	3.00	3.02	0.02	0.0221
B+C:	123	1.25	1.26	0.01	0.0068
B-C:	123	0.75	0.753	0.003	0.0029

s.d.(AB) S(between runs): 0.01

Sw(within run): 0.01

S/Sw: 1.1

s.d.(BC) S(between runs): 0.03

Sw(within run): 0.01

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

4.77	-	5.23	for	A+B
2.85	-	3.15	for	A-B
1.175	-	1.325	for	B+C
0.700	-	0.800	for	B-C

## DUPLICATES:

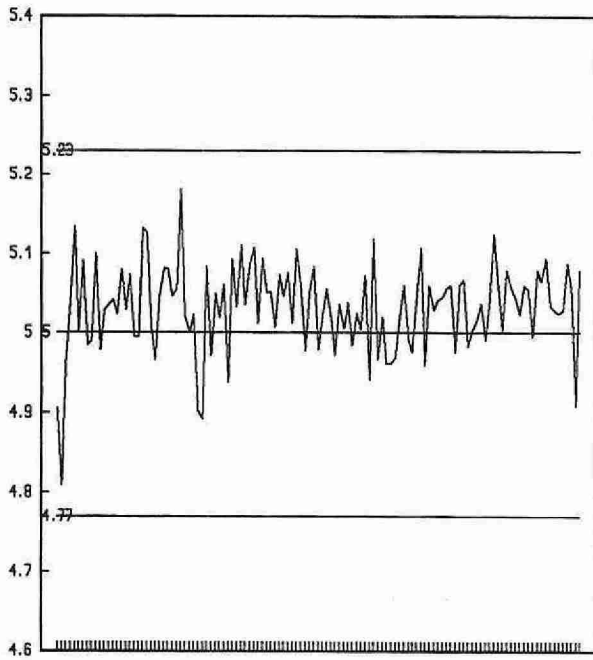
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
17	0.000 - 0.500	0.0071	4.1
59	0.501 - 1.00	0.0102	2.7
170	1.01 - 2.50	0.0193	2.5
95	2.51 - 5.00	0.0395	1.4
341	Overall	0.0222	

## OTHER CHECKS:

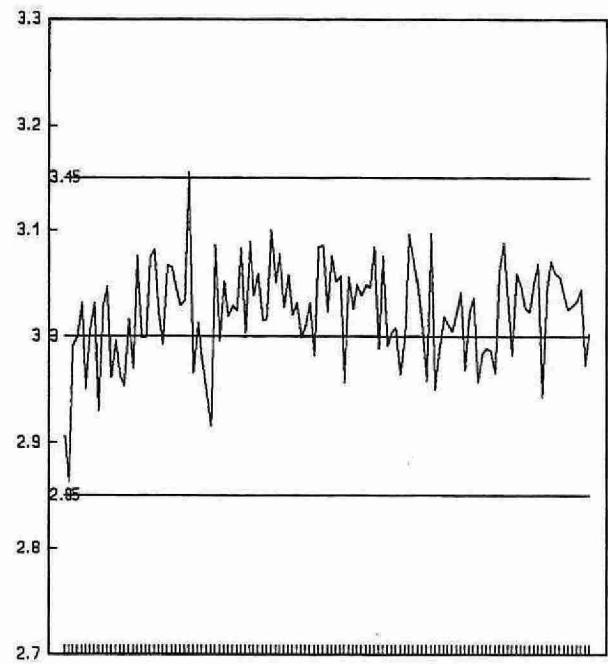
	n	Mean	Standard Deviation (1)
Long Term Blank	123	0.0023	0.0074

POTASSIUM (mg/L as K)

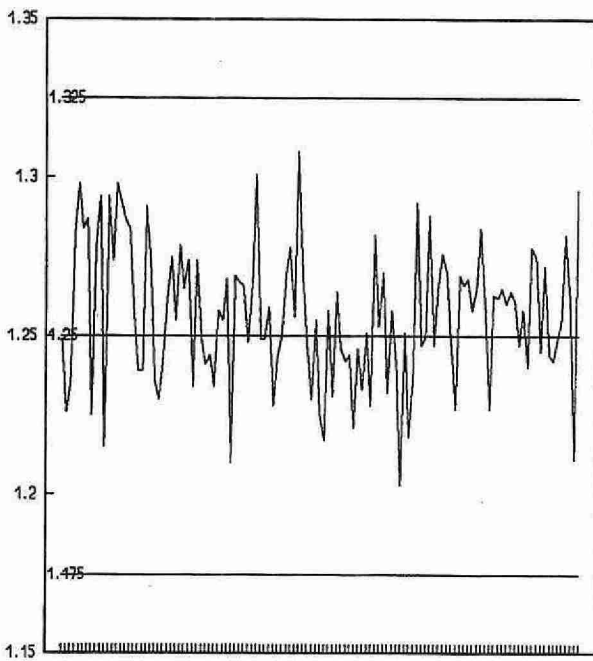
QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/95



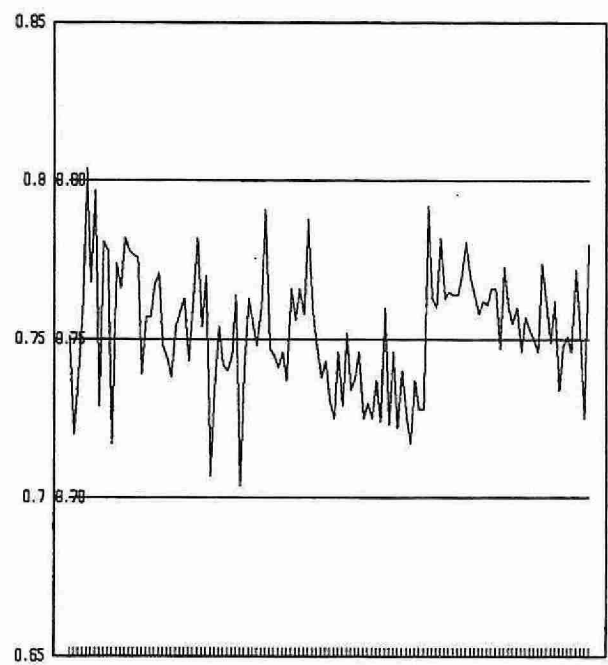
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## POTASSIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	08/04/86
Method Reference No.	E3217A	Units	mg/L as K
LIMS Product Code	CAT3217,K3217	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents, Sewage, Industrial Wastes		

### SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm using an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 1.16 at full scale level.

### INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

BL plus 11 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

# POTASSIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 28/12/95

Laboratory Unit: Absorption

Full Scale: to 25.0 mg/L as K

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	120	20.00	19.80	-0.20	0.2758
B:	120	5.00	4.94	-0.06	0.1322
C:	120	1.25	1.24	-0.01	0.0329
A+B:	120	25.00	24.75	-0.25	0.3526
A-B:	120	15.00	14.86	-0.14	0.2339
B+C:	120	6.25	6.19	-0.06	0.1476
B-C:	120	3.75	3.70	-0.05	0.0975

s.d.(AB) S(between runs): 0.22

Sw(within run): 0.17

S/Sw: 1.3

s.d.(BC) S(between runs): 0.10

Sw(within run): 0.07

S/Sw: 1.4

The calibration is accepted if the calibration control values obtained lie within the ranges:

23.8	-	26.2	for	A+B
14.2	-	15.8	for	A-B
5.65	-	6.85	for	B+C
3.35	-	4.15	for	B-C

## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
258	0.00 - 2.50	0.0275	6.0
46	2.51 - 5.00	0.0393	1.5
26	5.01 - 12.50	0.0554	0.6
15	12.51 - 25.00	0.2044	1.2
345	Overall	0.0343	

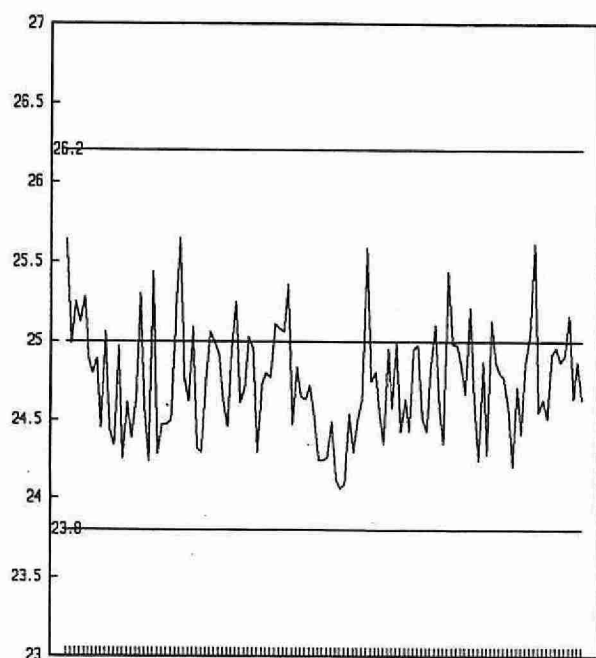
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	117	-0.0020	0.0174

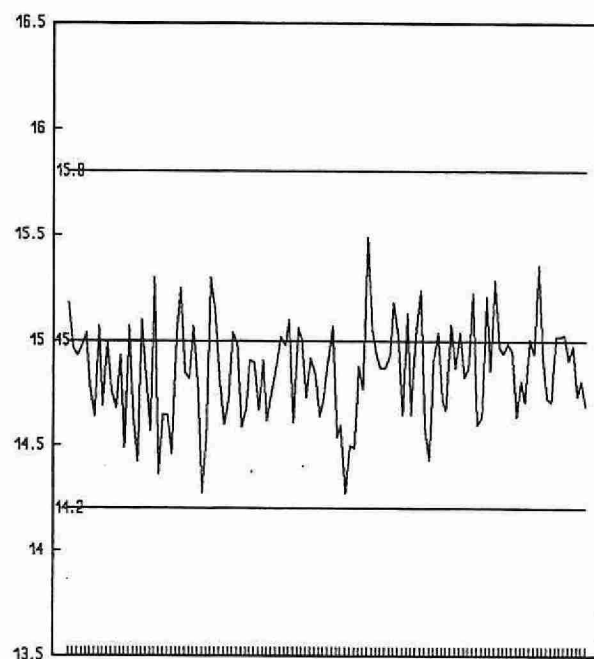


POTASSIUM (mg/L as K)

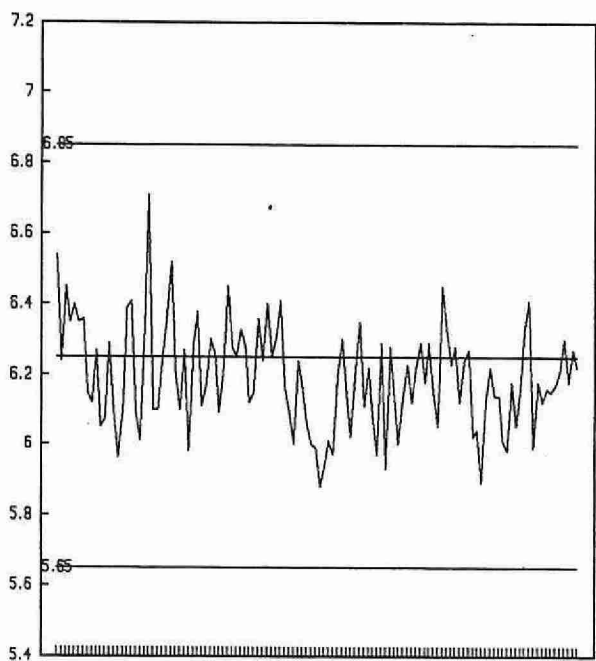
QUALITY CONTROL DATA FROM 03/01/95 TO 28/12/95



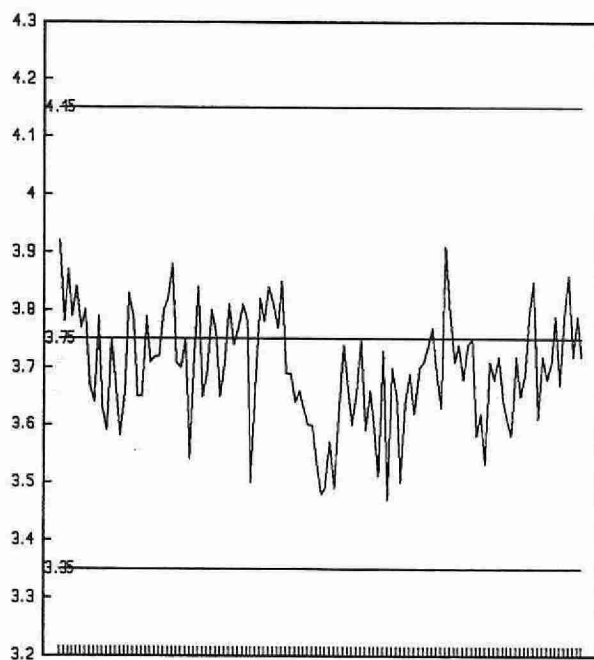
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## POTASSIUM

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Units	mg/L as K
LIMS Product Code	CAT3249	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes,		

### SAMPLING:

Quantity Required	5 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 766.5 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

### INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

### NOTES:

The control standards are corrected for the LTB from which they were made.

# POTASSIUM

QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/95

Laboratory Unit: Dorset

Full Scale: to 1.0 mg/L as K

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	57	0.80	0.804	0.004	0.0043
B:	57	0.20	0.2002	0.0002	0.0039
C:	57	0.05	0.051	0.001	0.0024
A+B:	57	1.00	1.002	0.002	0.0067
A-B:	57	0.60	0.604	0.004	0.0052
B+C:	57	0.25	0.249	-0.001	0.0044
B-C:	57	0.15	0.149	-0.001	0.0036

s.d.(AB) S(between runs): 0.004

Sw(within run): 0.0036

S/Sw: 1.1

s.d.(BC) S(between runs): 0.003

Sw(within run): 0.0025

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.973	-	1.027	for	A+B
0.580	-	0.620	for	A-B
0.228	-	0.272	for	B+C
0.134	-	0.166	for	B-C

## DUPLICATES:

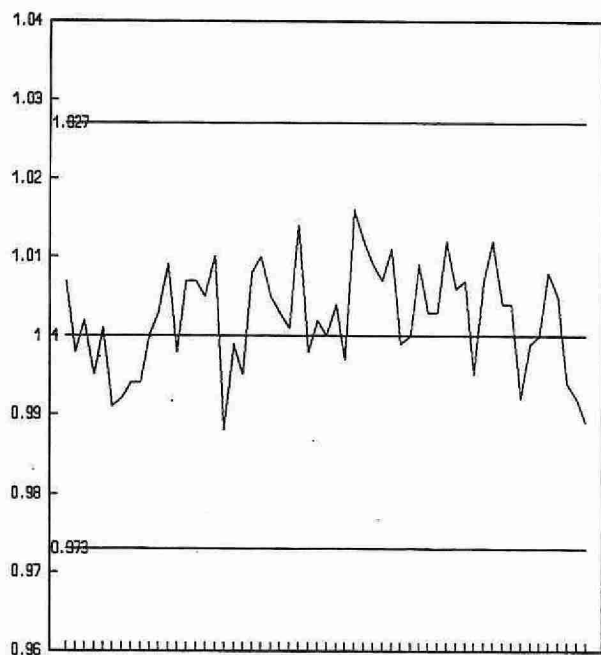
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
31	0.00 - 0.10	0.0021	7.3
24	0.11 - 0.20	0.0102	7.3
61	0.21 - 0.50	0.0128	6.2
33	0.51 - 1.00	0.0170	4.2
149	Overall	0.0101	

## OTHER CHECKS:

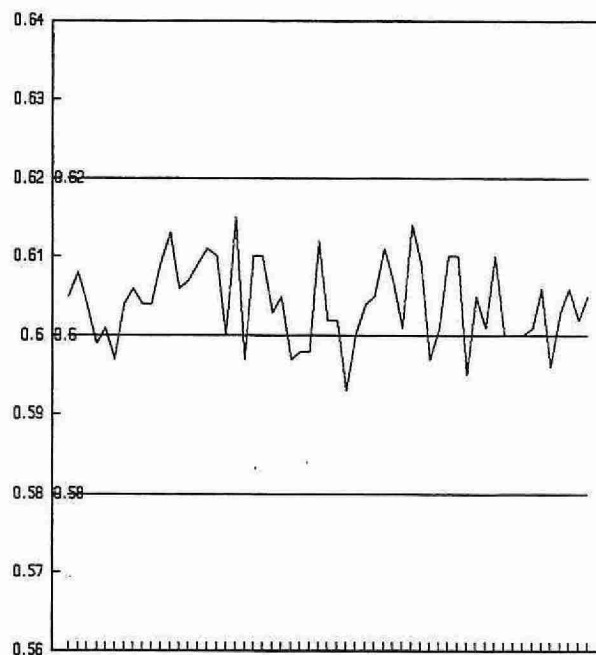
	n	Mean	Standard Deviation (1)
Long Term Blank	57	0.0012	0.0024

# POTASSIUM (mg/L as K)

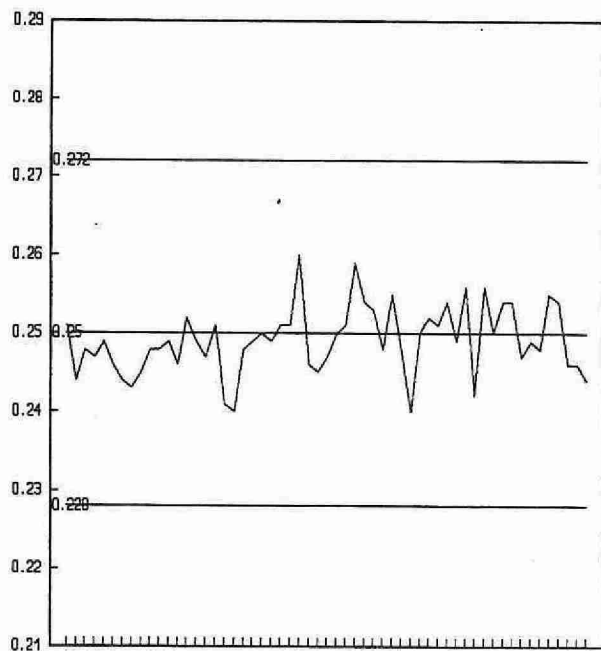
QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/95



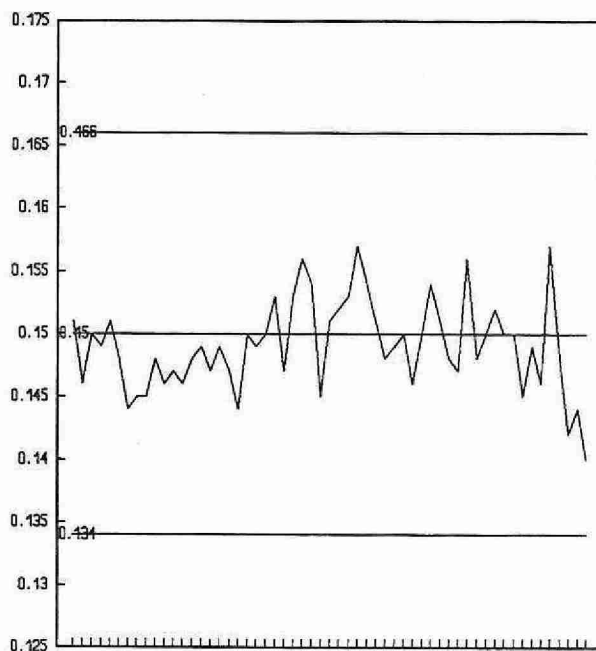
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## SILICON, REACTIVE SILICATES

### IDENTIFICATION:

Laboratory Unit	Colourimetry	Method Introduced	01/02/75
Method Reference No.	E3370A	Units	mg/L as Si
LIMS Product Code	DCSI3370	Supervisor	J.McBride
Sample Type/Matrix	Rivers, Lakes, Precipitation, Soil Extracts, Effluents, Domestic Water Supplies, Leachates		

### SAMPLING:

Quantity Required	10 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Reactive silicates are determined by formation of a reduced molybdo-silicate complex at pH 1.6, using ascorbic acid as the reducing agent, and oxalic acid to suppress phosphate interference.

Approximate absorbance: 0.7 at the full scale level.

Dissolved inorganic and dissolved organic carbon are determined simultaneously.

### INSTRUMENTATION:

Basic automated modular continuous flow system with colourimetric measurement through a 5.0 cm. light path at 660 nm. Data capture, reduction, and processing via a multi-stage microcomputer system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.10
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; standard every 20 samples.

### NOTES:

Sept.'94 the method codes ROM-E3176A, and E3178A were amalgamated and a new method code ROM-E3370A was generated.

# SILICON, REACTIVE SILICATES

QUALITY CONTROL DATA FROM 04/01/95 TO 21/12/95

Laboratory Unit: Colourimetry

Full Scale: to 10.0 mg/L as Si

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	168	8.00	8.001	0.001	0.0253
B:	168	2.00	2.001	0.001	0.0137
C:	168	0.50	0.499	-0.001	0.0067
A+B:	168	10.00	10.001	0.001	0.0325
A-B:	168	6.00	6.000	0.000	0.0245
B+C:	168	2.50	2.500	0.000	0.0161
B-C:	168	1.50	1.502	0.002	0.0144

s.d.(AB) S(between runs): 0.020

Sw(within run): 0.017

S/Sw: 1.2

s.d.(BC) S(between runs): 0.011

Sw(within run): 0.010

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.66	-	10.34	for	A+B
5.75	-	6.25	for	A-B
2.37	-	2.63	for	B+C
1.40	-	1.60	for	B-C

## DUPLICATES:

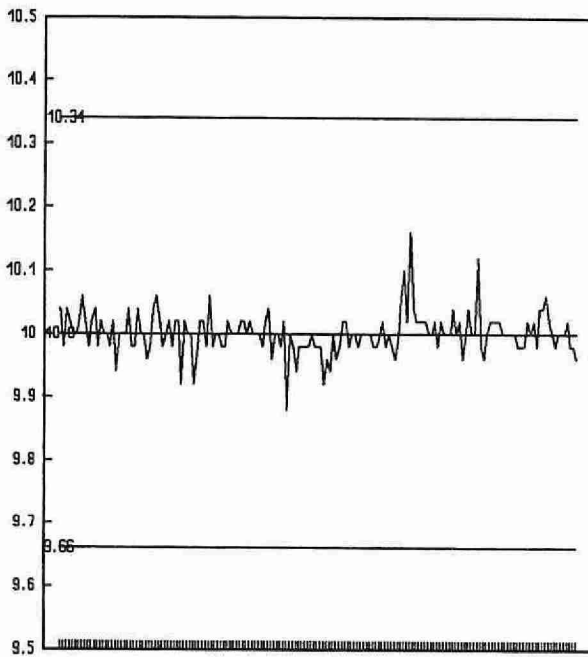
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
205	0.00 - 1.00	0.0347	8.8
81	1.01 - 2.00	0.0716	4.7
144	2.01 - 5.00	0.0166	0.6
62	5.01 - 10.0	0.0349	0.7
492	Overall	0.0417	

## OTHER CHECKS:

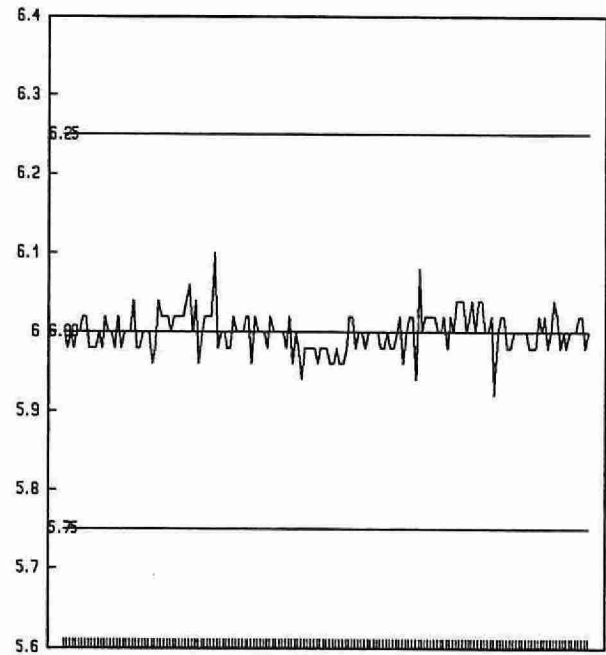
	n	Mean	Standard Deviation (1)
Long Term Blank	168	-0.0021	0.0085

SILICON, REACTIVE SILICATES (mg/L as Si)

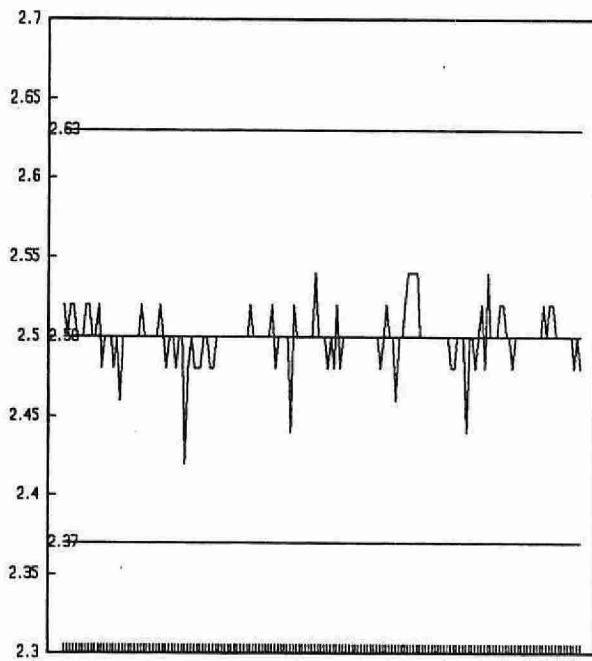
QUALITY CONTROL DATA FROM 04/01/95 TO 21/12/95



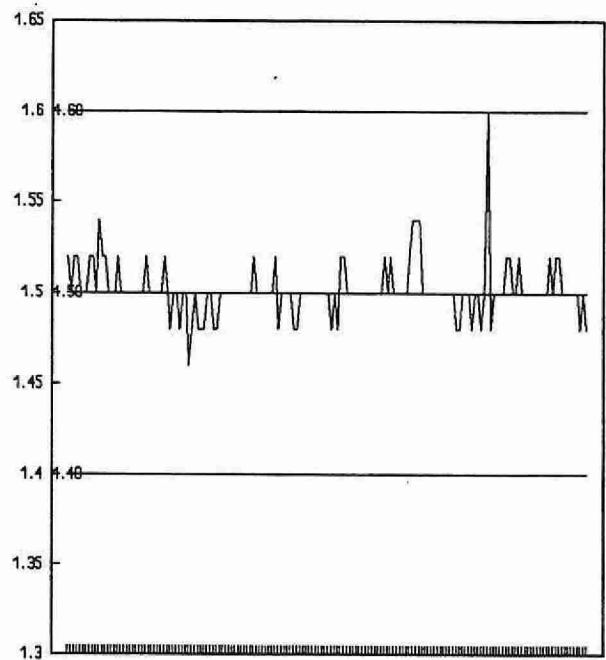
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## SODIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	18/05/79
Method Reference No.	E3146A	Units	mg/L as Na, (µg/Filter)
LIMS Product Code	CAT3146, (NAK3146)	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, (LOVOL Filter Extracts)		

### SAMPLING:

Quantity Required	5 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.0 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

### INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures	Current W value		Current T value	
3	0.002 mg/L	0.1 µg/Filter	0.010 mg/L	0.5 µg/Filter

### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.



# SODIUM

QUALITY CONTROL DATA FROM 05/01/95 TO 13/10/95

Laboratory Unit: Atomic Absorption

Full Scale: to 1.0 mg/L as Na

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	24	0.60	0.605	0.005	0.0072
B:	24	0.10	0.104	0.004	0.0044
A+B:	24	0.70	0.708	0.008	0.0090
A-B:	24	0.50	0.501	0.001	0.0079

s.d.(AB)

S(between runs): 0.0060

Sw(within run): 0.0056

S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

0.671 - 0.729 for A+B

0.478 - 0.522 for A-B

## DUPLICATES:

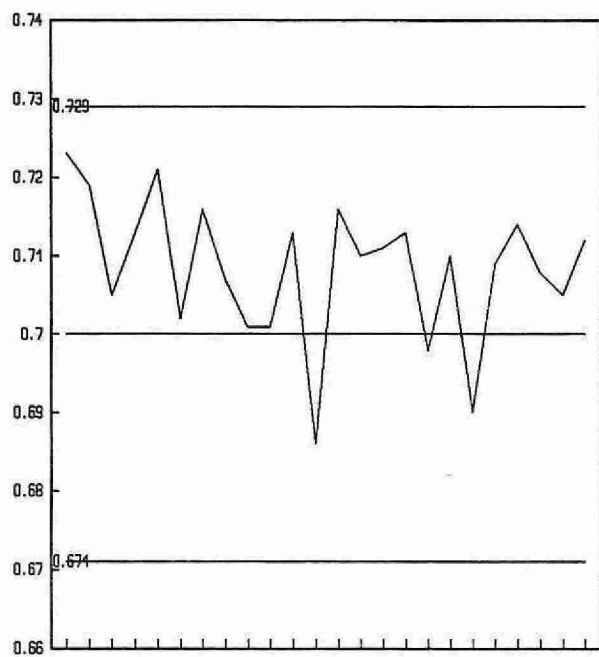
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
28	0.000 - 0.100	0.0012	7.2
11	0.101 - 0.200	0.0032	2.8
9	0.201 - 0.50	0.0017	1.1
2	0.501 - 1.00	N.A.	N.A.
50	OVERALL	0.0020	

## OTHER CHECKS:

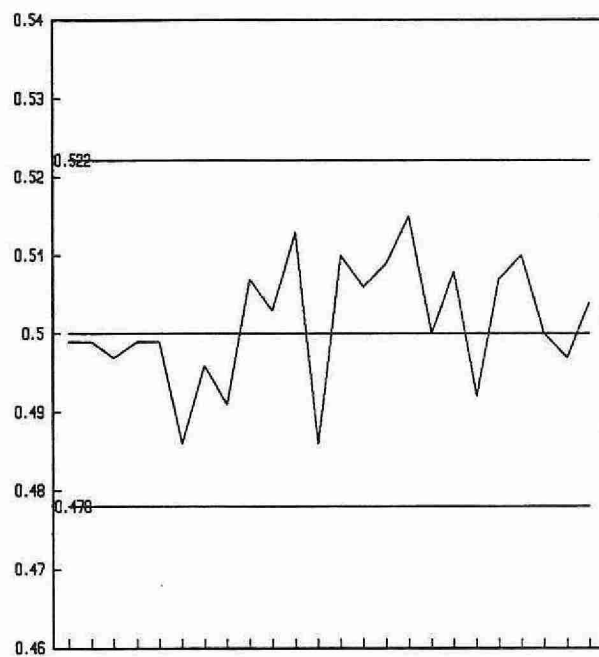
	n	Mean	Standard Deviation (1)
Long Term Blank	24	-0.002	0.0454

# SODIUM (mg/L as Na)

QUALITY CONTROL DATA FROM 05/01/95 TO 13/10/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## SODIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	01/04/74
Method Reference No.	E3171A	Units	mg/L as Na
LIMS Product Code	CAT3171,NAK3171	Supervisor	J. McBride
Sample Type/Matrix	Surface Waters, DWSP Drinking Waters		

### SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.7 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 1.16 at the full scale level.

### INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02	Current T value: 0.10
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### CALIBRATION:

BL plus 11 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

# SODIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/95

Laboratory Unit: Atomic Absorption

Full Scale: to 20.0 mg/L as Na

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	125	16.0	16.1	0.1	0.1309
B:	125	4.00	4.05	0.05	0.0586
C:	125	1.00	1.01	0.01	0.0205
A+B:	125	20.0	20.2	0.2	0.1484
A-B:	125	12.0	12.1	0.1	0.1383
B+C:	125	5.00	5.06	0.06	0.0730
B-C:	125	3.00	3.04	0.04	0.0487

s.d.(AB) S(between runs): 0.10

Sw(within run): 0.10

S/Sw: 1.0

s.d.(BC) S(between runs): 0.04

Sw(within run): 0.03

S/Sw: 132

The calibration is accepted if the calibration control values obtained lie within the ranges:

19.4	-	20.6	for	A+B
11.6	-	12.4	for	A-B
4.70	-	5.30	for	B+C
2.80	-	3.20	for	B-C

## DUPLICATES:

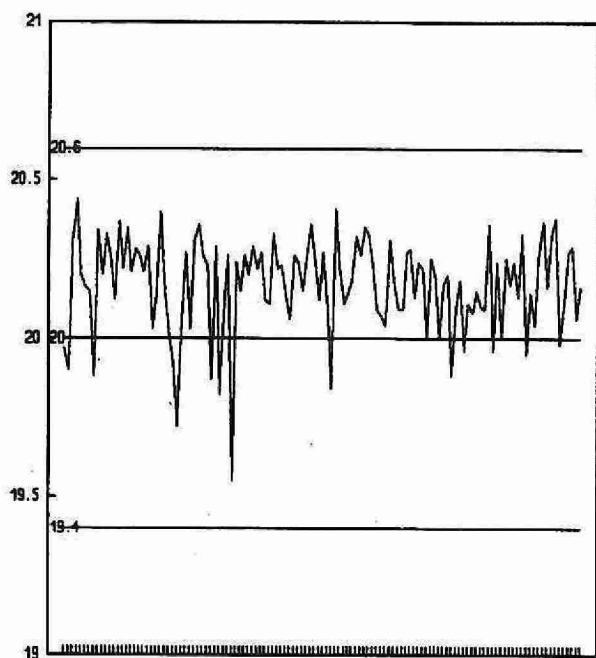
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
24	0.00 - 2.00	0.0373	4.2
45	2.01 - 4.00	0.0333	1.1
102	4.01 - 10.0	0.0712	2.1
96	10.0 - 20.0	0.1364	1.9
237	Overall	0.0792	

## OTHER CHECKS:

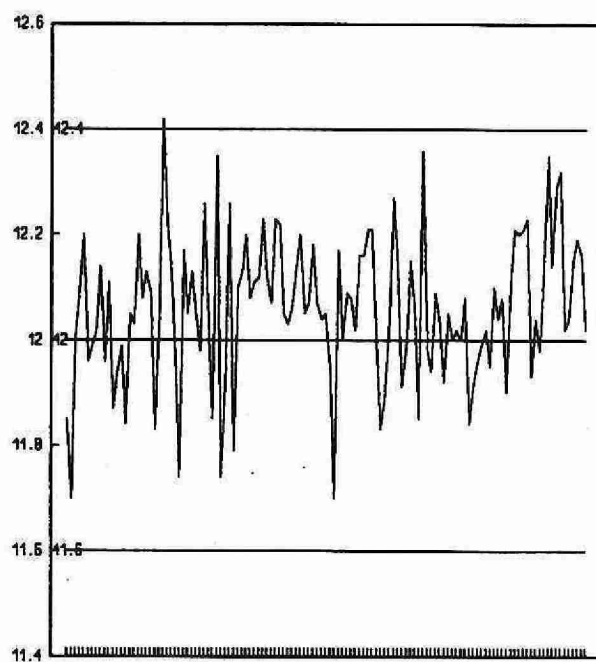
	n	Mean	Standard Deviation (1)
Long Term Blank	125	-0.0011	0.0075

SODIUM (mg/L as Na)

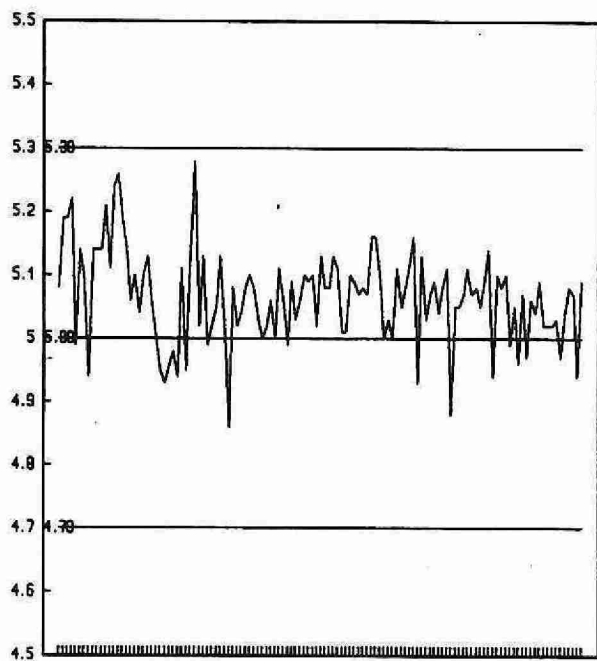
QUALITY CONTROL DATA FROM 03/01/95 TO 20/12/95



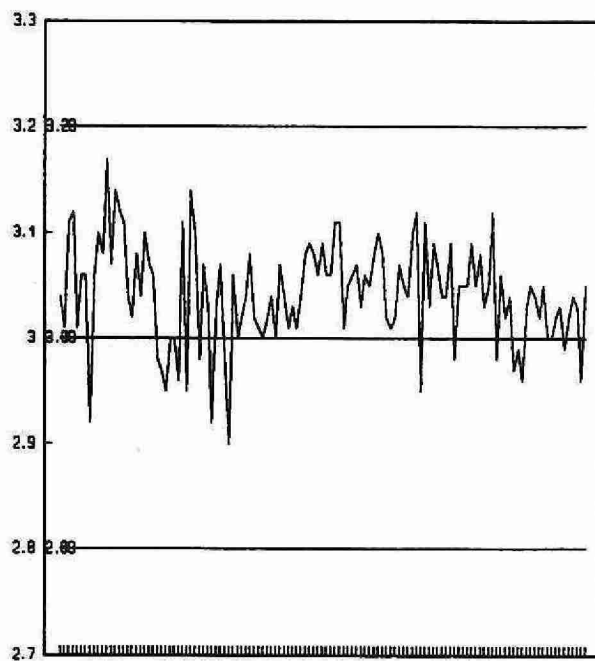
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## SODIUM

### IDENTIFICATION:

Laboratory Unit	Atomic Absorption	Method Introduced	08/04/86
Method Reference No.	E3217A	Units	mg/L as Na
LIMS Product Code	CAT3217,CATS3217,NA3217	Supervisor	J. McBride
Sample Type/Matrix	Domestic Waters, Leachates, Effluents, Sewage,Industrial Wastes		

### SAMPLING:

Quantity Required	6 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.0 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 1.21 at the full scale level.

### INSTRUMENTATION:

Automated flow injection atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.2	Current T value: 1.0
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### CALIBRATION:

BL plus 11 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL every 10 samples; 2 standards every 20 samples.

# SODIUM

QUALITY CONTROL DATA FROM 03/01/95 TO 22/12/95

Laboratory Unit: Absorption

Full Scale: to 100.00 mg/L as Na

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	163	80.0	79.46	-0.54	1.7799
B:	163	20.0	19.82	-0.18	0.4777
C:	163	5.0	4.99	-0.01	0.1346
A+B:	163	100.0	99.16	-0.84	1.3765
A-B:	163	60.0	59.53	-0.47	0.9836
B+C:	163	25.0	24.81	-0.19	0.5871
B-C:	163	15.0	14.82	-0.18	0.3988

s.d.(AB) S(between runs): 1.30

Sw(within run): 0.70

S/Sw: 1.9

s.d.(BC) S(between runs): 0.35

Sw(within run): 0.28

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

95.50	-	104.50	for	A+B
57.00	-	63.00	for	A-B
22.25	-	27.75	for	B+C
13.50	-	16.50	for	B-C

## DUPLICATES:

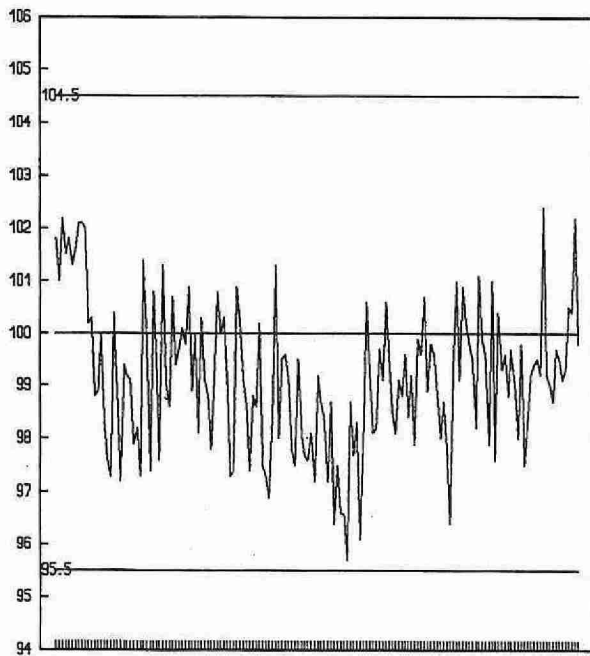
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
159	0.00 - 10.00	0.1376	2.8
153	10.01 - 25.00	0.2051	1.5
77	25.01 - 50.00	0.3454	1.1
74	50.01 - 100.00	0.7294	1.0
463	Overall	0.2673	

## OTHER CHECKS:

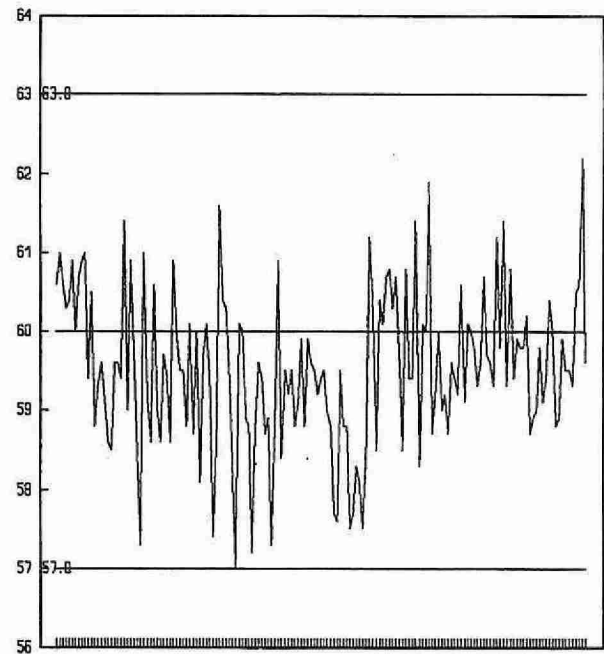
	n	Mean	Standard Deviation (1)
Long Term Blank	159	0.0113	0.0539

SODIUM (mg/L as Na)

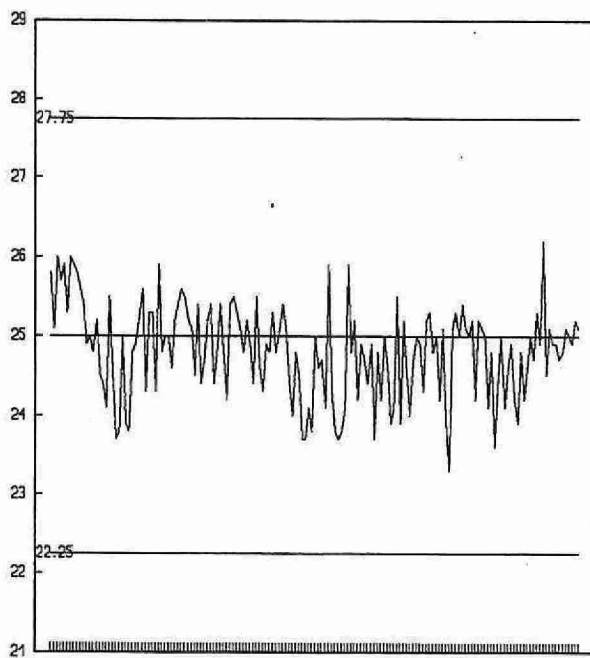
QUALITY CONTROL DATA FROM 03/01/95 TO 22/12/95



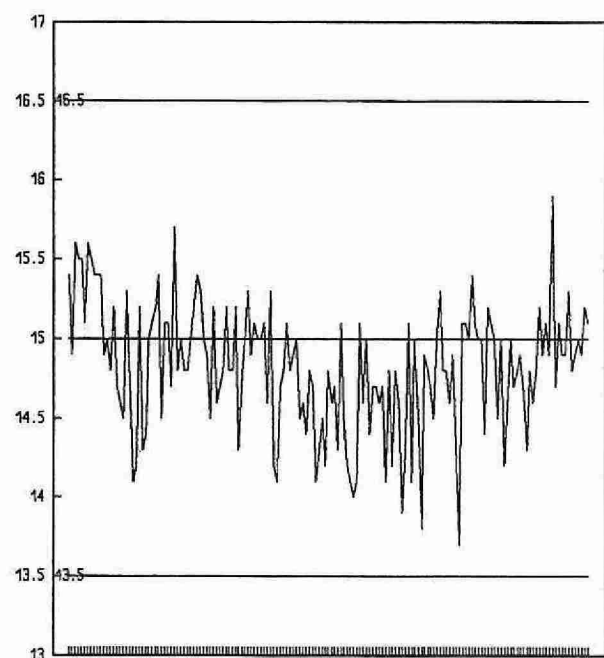
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT



## SODIUM

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	20/07/88
Method Reference No.	E3249A	Units	mg/L as Na
LIMS Product Code	CAT3249	Supervisor	J. McBride
Sample Type/Matrix	Rivers, Lakes,		

### SAMPLING:

Quantity Required	5 mL
Container	Plastic

### ANALYTICAL PROCEDURE:

Samples are analyzed by AAS at 589.0 nm with an air-acetylene flame. Cesium chloride is added as a suppressant via an automated sampling train.

Approximate absorbance: 0.5 at the full scale level.

### INSTRUMENTATION:

Automated modular atomic absorption spectrophotometer (AAS) system.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.005	Current T value: 0.025
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### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration	LTBL plus 3 standards, e.g., QCA
Drift	BL, reslope standard every 10 samples.

### NOTES:

The control standards are corrected for the LTB from which they were made.

# SODIUM

QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/95

Laboratory Unit: Dorset

Full Scale: to 4.0 mg/L as Na

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	59	3.2	3.199	-0.001	0.0200
B:	59	0.8	0.801	0.001	0.0070
C:	59	0.2	0.203	0.003	0.0034
A+B:	59	4.0	3.997	-0.003	0.0209
A-B:	59	2.4	2.398	-0.002	0.0201
B+C:	59	1.0	1.001	0.001	0.0100
B-C:	59	0.6	0.598	-0.002	0.0064

s.d.(AB) S(between runs): 0.015

Sw(within run): 0.014

S/Sw: 1.05

s.d.(BC) S(between runs): 0.006

Sw(within run): 0.004

S/Sw: 1.22

The calibration is accepted if the calibration control values obtained lie within the ranges:

3.91	-	4.09	for	A+B
2.33	-	2.47	for	A-B
0.958	-	1.04	for	B+C
0.568	-	0.632	for	B-C

## DUPLICATES:

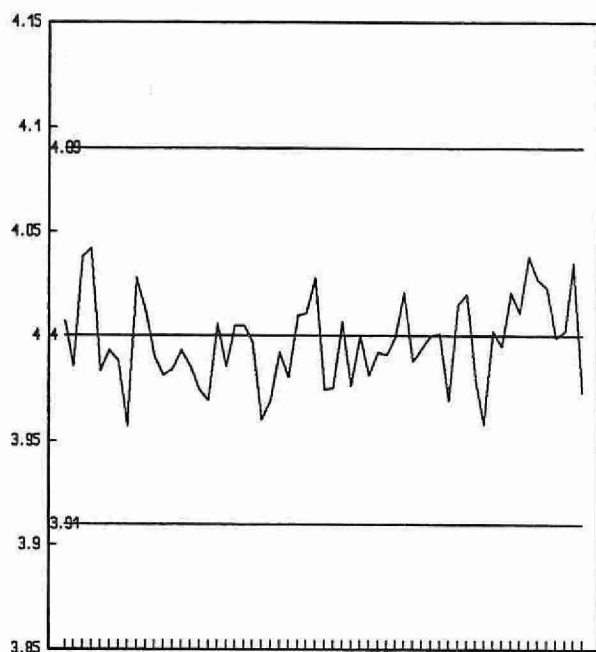
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
30	0.00 - 0.40	0.0058	9.3
71	0.41 - 0.80	0.0157	3.8
38	0.81 - 2.00	0.0250	2.1
16	2.01 - 4.00	0.0327	1.7
155	Overall	0.0182	

## OTHER CHECKS:

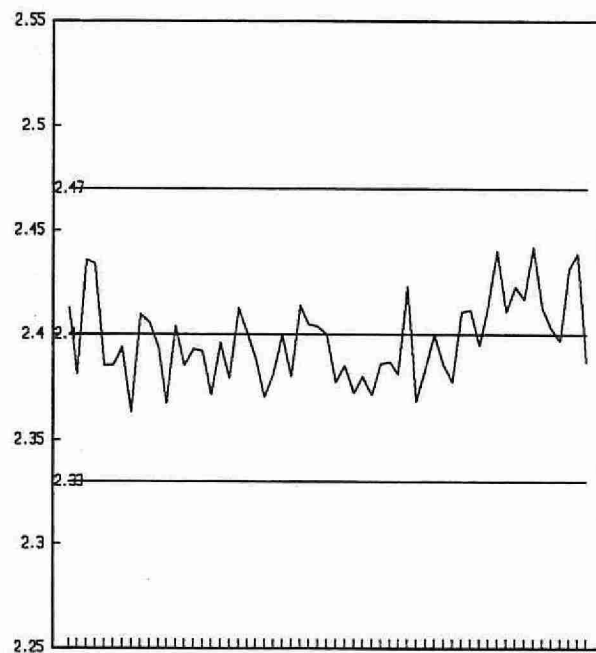
	n	Mean	Standard Deviation (1)
Long Term Blank	59	0.0017	0.0043

# SODIUM (mg/L as Na)

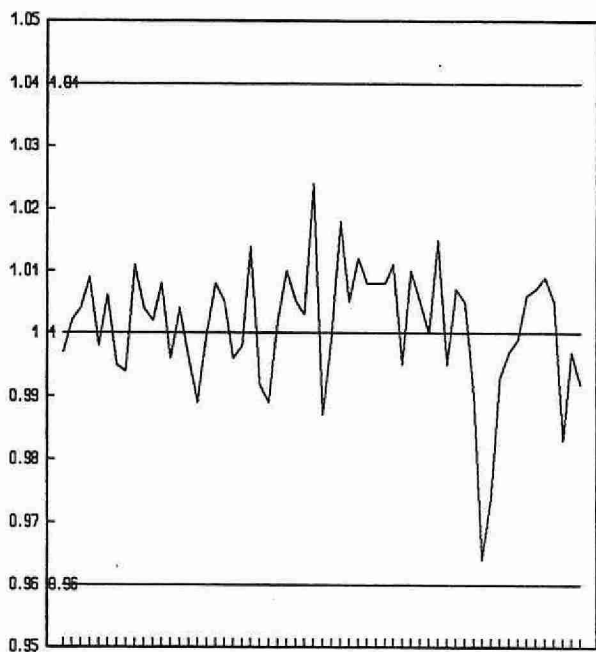
QUALITY CONTROL DATA FROM 16/01/95 TO 20/12/95



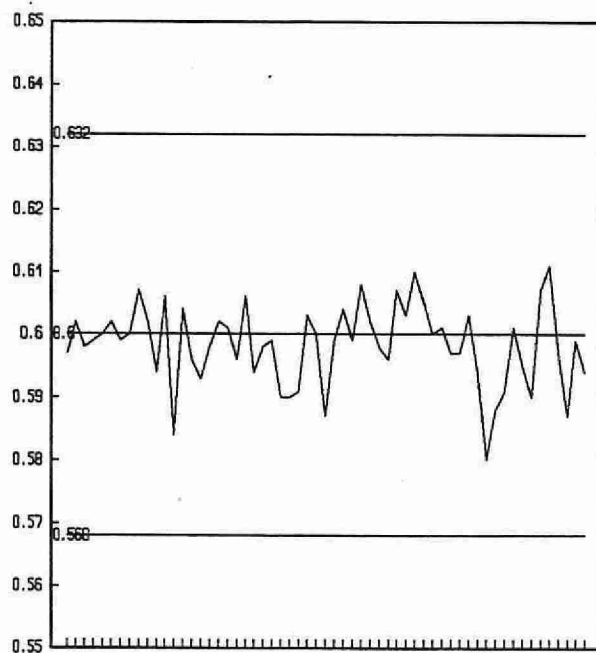
QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B



QUALITY CONTROL STANDARD B+C



QUALITY CONTROL STANDARD B-C

CONTROL LIMIT

## SOLIDS, DISSOLVED

### IDENTIFICATION:

Laboratory Unit	Solids	Method Introduced	Before '61
Method Reference No.	E3188B	Units	mg/L
LIMS Product Code	TSD3188,DS3188,DIGN3188	Supervisor	F. Lo
Sample Type/Matrix	Sewage, Industrial Waste		

### SAMPLING:

Quantity Required	125 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Sample is filtered under moderate suction through a Whatman 934AH grade glass fibre filter. Generally 100 mL of filtrate (alternate 50 mL) is pipetted into a preweighed Teflon dish, dried at 103  $\pm$  2  $^{\circ}$ C, and stored in a desiccator for at least 24 hours. The dissolved solids content is calculated by subtracting the original dish mass from the dried residue + dish mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

### INSTRUMENTATION:

Balance (5 decimal places), drying oven, suction filtration apparatus, dishes (Teflon).  
Microcomputer system with appropriate software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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### CALIBRATION:

Balance zero  
Balance internal calibration is performed daily.

### CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1
Method Blank	100 mL distilled water.

### NOTES:

In June 1994, Solids method E3188B was written to include methods for all Solids fractions (Total, Suspended, Dissolved and Ignited) on sewage and industrial waste samples. The former methods which covered these techniques for all matrices, were discontinued ie., E3188A, E3190A, E3192A, and E3194A.

# SOLIDS, DISSOLVED

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95

Laboratory Unit: Solids

## CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	247	50.00	49.99997	-0.00003	0.000075
B:	247	30.00	30.00009	0.00009	0.000060
A+B:	247	80.00	80.00006	0.00006	0.000120
A-B:	247	20.00	19.99988	-0.00012	0.000063

s.d.(AB) S(between runs): 0.000068 Sw(within run): 0.000044 S/Sw: 1.5

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

79.9996 - 80.0004 for A+B  
19.9997 - 20.0003 for A-B

## RECOVERIES:

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
55	2000.0	1996.18	13.0513
55	500.0	498.5	6.3183

## DUPLICATES:

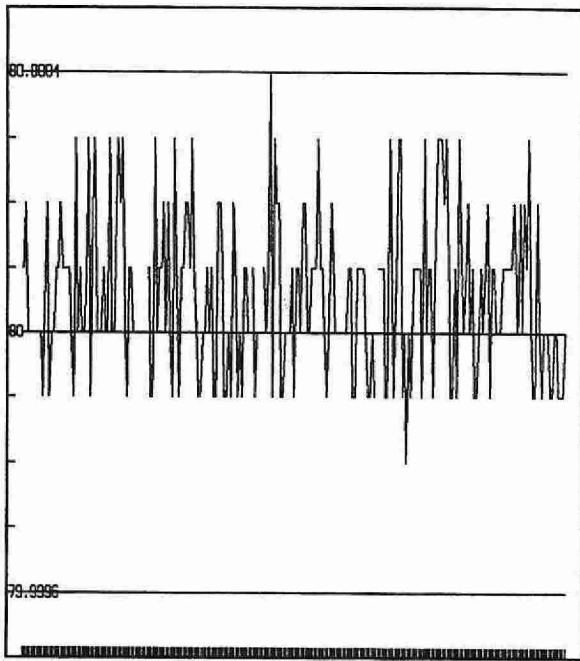
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
47	0 - 500	4.6716	2.25
44	501 - 1000	6.8454	1.29
30	1001 - 5000	8.1912	0.44
3	5001 - 10000	29.7159	0.14
124	Overall	6.9448	

## OTHER CHECKS:

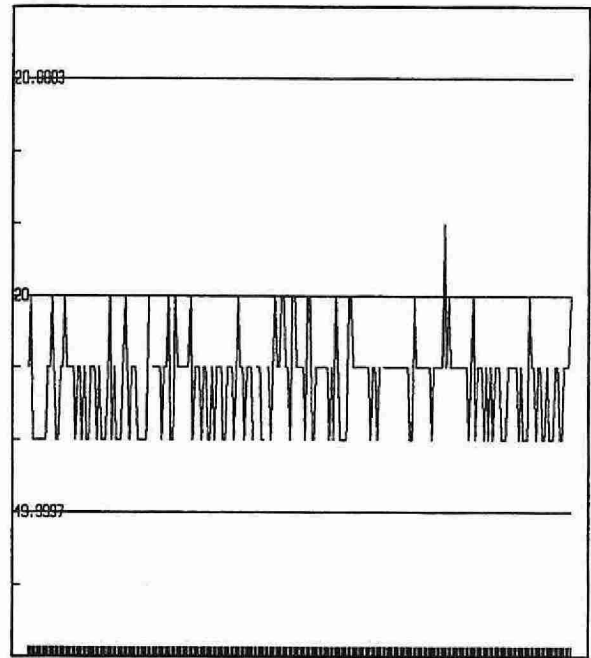
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	54	-0.0354	3.4170

SOLIDS, DISSOLVED (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## SOLIDS, DISSOLVED

### IDENTIFICATION:

Laboratory Unit	Solids River	Method Introduced	Before '61
Method Reference No.	E3365A	Units	mg/L
LIMS Product Code	TSD3365,DS3365	Supervisor	F. Lo
Sample Type/Matrix	Domestic Waters, Surface Waters, Leachates		

### SAMPLING:

Quantity Required	125 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Sample is filtered under moderate suction through a Whatman 934AH grade glass fibre filter. Generally 100 mL of filtrate (alternate 50 mL) is pipetted into a preweighed Teflon dish, dried at 103-105°C, and stored in a desiccator for at least 24 hours. The dissolved solids content is calculated by subtracting the original dish mass from the dried dish mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system. Dissolved solids may be calculated, if the conductivity is less than 800  $\mu$ S by the equation:

$$\text{Dissolved Solids} = \text{Conductivity} \times 0.65$$

### INSTRUMENTATION:

Balance (5 decimal places), drying oven, suction filtration apparatus, dishes (Teflon).  
Microcomputer system with appropriate software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 2	Current T value: 10
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### CALIBRATION:

Balance zero  
Balance internal calibration is performed daily.

### CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1.
Method Blank	100 mL distilled water.

### NOTES:

In June 1994, Solids method E3365A was written to include methods for all Solids fractions (Total, Suspended, and Dissolved) on surface and drinking waters. The former methods which covered these techniques for all matrices, were discontinued ie., E3188A, E3190A, and E3192A.

# SOLIDS, DISSOLVED

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95

Laboratory Unit: River Solids

## CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	134	50.00	50.00047	0.00047	0.000076
B:	134	30.00	30.00031	0.00031	0.000065
A+B:	134	80.00	80.00078	0.00078	0.000127
A-B:	134	20.00	20.00017	0.00017	0.000063

s.d.(AB) S(between runs): 0.000071 Sw(within run): 0.000045 S/Sw: 1.6

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

80.00045 - 80.00114 for A+B  
19.99994 - 20.00046 for A-B

## RECOVERIES:

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
82	2000.0	1996.5	21.9
84	500.0	500.8	13.8

## DUPLICATES:

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
21	0 - 500.0	5.2233	2.4
150	500.1 - 1000.0	11.838	2.6
38	1000.1 - 5000.0	11.328	1.5
209	OVERALL	10.979	

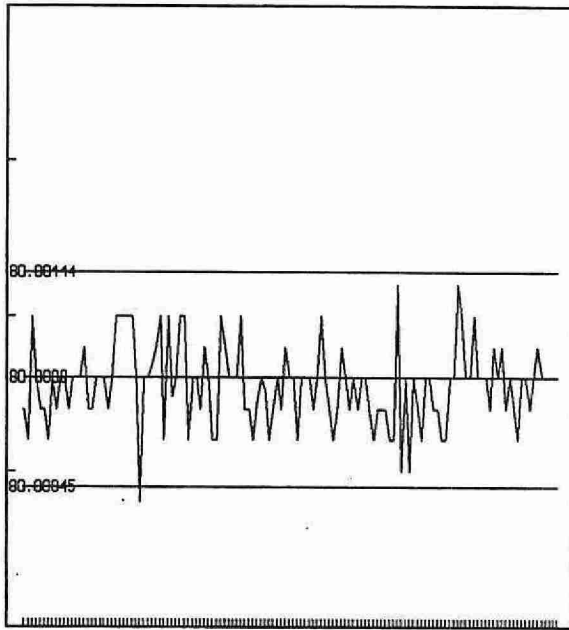
## OTHER CHECKS:

	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	88	-0.054	11.1

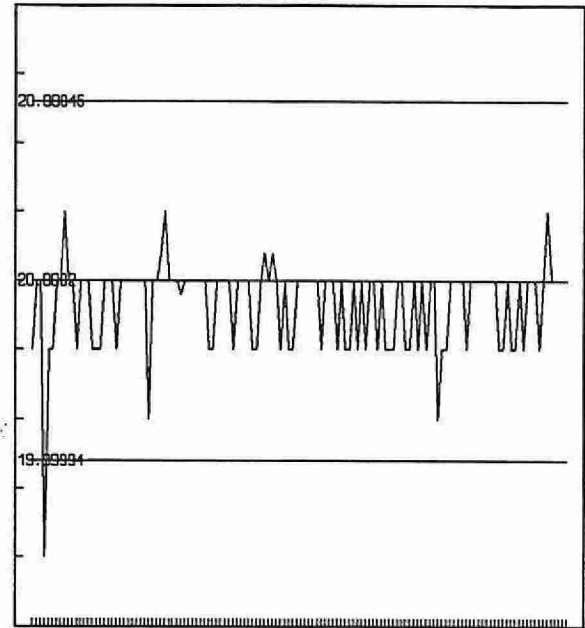


SOLIDS, DISSOLVED (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## SOLIDS, SUSPENDED

### IDENTIFICATION:

Laboratory Unit	Solids	Method Introduced	Before '81
Method Reference No.	E3188B	Units	mg/L
LIMS Product Code	TSD3188,SS3188,SIGN3188	Supervisor	F. Lo
Sample Type/Matrix	Sewage, Industrial Waste		

### SAMPLING:

Quantity Required	5-500 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

An appropriately shaken sample volume (5 to 500 mL) is pipetted or quickly poured into a graduated cylinder, and the volume is measured. The aliquot is then filtered under moderate suction through a preweighed Whatman 934AH glass fibre filter. The graduated cylinder and then the filter are washed with a total of 50 mL distilled water. The filter is dried at 103-105°C, and suspended solids content is calculated by subtracting the original filter mass from the dried filter mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

### INSTRUMENTATION:

Balance (5-decimal places), drying oven, suction filtration apparatus.  
Microcomputer system with appropriate software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
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### CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1
Method Blank	Filter washed with 500 mL distilled water

### NOTES:

A standard correction factor (-0.0003g) was applied to all filters to account for weight loss during filtering.

In June 1994, Solids method E3188B was written to include methods for all Solids fractions (Total, Suspended, Dissolved and Ignited) on sewage and industrial waste samples. The former methods which covered these techniques for all matrices, were discontinued ie., E3188A, E3190A, E3192A, and E3194A.

# SOLIDS, SUSPENDED

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95

Laboratory Unit: Solids

CALIBRATION CONTROL: (QC data from SS3188 and SIGN3188 )

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
C:	278	0.50	0.499998	-0.000002	0.000011
D:	278	0.05	0.049997	-0.000003	0.000011
C+D:	278	0.55	0.549995	-0.000005	0.000015
C-D:	278	0.45	0.450000	0.000000	0.000014

s.d.(AB) S(between runs): 0.00001 Sw(within run): 0.00001 S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

0.54992 - 0.55008 for A+B  
0.44994 - 0.45006 for A-B

RECOVERIES:

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
213	200.0	194.52	3.2816
215	50.0	49.14	1.5012

DUPLICATES:

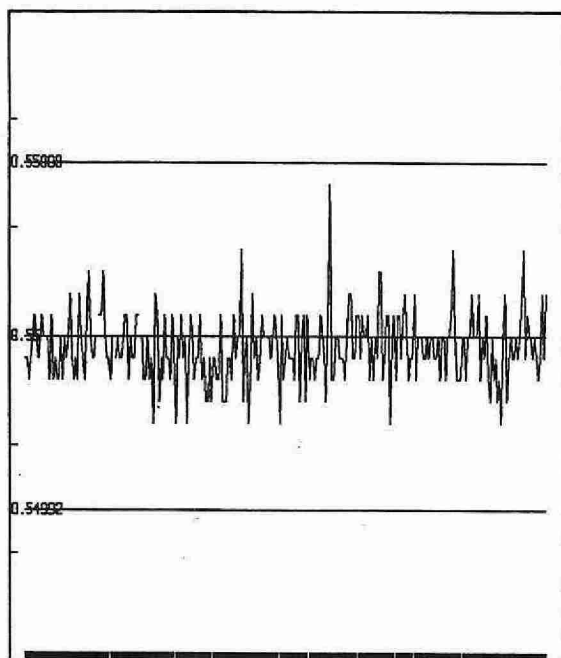
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
53	0 - 10	0.7265	16.9
84	10.1 - 25	1.7154	15.8
228	25.1 - 100	2.8674	212.4
180	100.1 - 500	10.676	9.4
13	500.1 - 1000	18.682	4.1
125	1000.1 - 10000	37.3452	6.6
3	10000.1 - 30000	N.A.	N.A.
686	Overall	5.1707	

OTHER CHECKS:

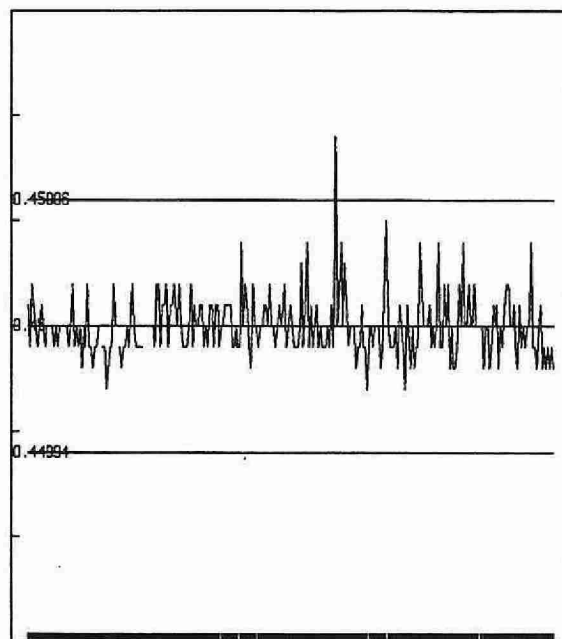
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	215	0.0477	0.2044

SOLIDS, SUSPENDED (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

CONTROL LIMIT

## SOLIDS, SUSPENDED

### IDENTIFICATION:

Laboratory Unit	Solids River	Method Introduced	Before '81
Method Reference No.	E3365A	Units	mg/L
LIMS Product Code	SS3365, TSD3365	Supervisor	F. Lo
Sample Type/Matrix	Drinking Waters, Landfill, Leachates, Surface Waters		

### SAMPLING:

Quantity Required	5-500 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

An appropriately shaken sample volume (5 to 500 mL) is pipetted or quickly poured into a graduated cylinder, and the volume is measured. The aliquot is then filtered under moderate suction through a preweighed Whatman 934AH glass fibre filter. The graduated cylinder and then the filter are washed with a total of 30 mL distilled water. The filter is dried at 103-105°C, and suspended solids content is calculated by subtracting the original filter mass from the dried filter mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

### INSTRUMENTATION:

Balance (5-decimal places), drying oven, suction filtration apparatus.  
Microcomputer system with appropriate software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 1.0	Current T value: 5.0
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### CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1
Method Blank	Filter washed with 500 mL distilled water

### NOTES:

In June 1994, Solids method E3365A was written to include methods for all Solids fractions (Total, Suspended, and Dissolved) on surface and drinking waters. The former methods which covered these techniques for all matrices, were discontinued ie., E3188A, E3190A, and E3192A.

# SOLIDS, SUSPENDED

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95

Laboratory Unit: River Solids

## CALIBRATION CONTROL:

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	190	0.50	0.499928	-0.000072	0.000011
B:	190	0.05	0.049964	-0.000036	0.000012
A+B:	190	0.55	0.549892	-0.000108	0.000019
A-B:	190	0.45	0.449964	-0.000036	0.000012

s.d.(AB) S(between runs): 0.000011 Sw(within run): 0.000009 S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

0.549840 - 0.549960 for A+B  
0.449915 - 0.450005 for A-B

## RECOVERIES:

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
163	200.0	194.10	3.7795
162	50.0	48.64	3.9818

## DUPLICATES:

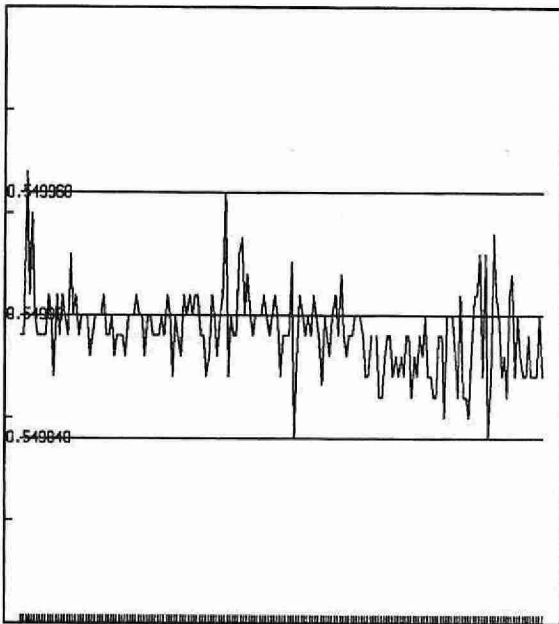
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
243	0.0 - 50.0	1.3610	11.9
81	50.1 - 200.0	5.3269	5.7
32	200.1 - 1000.0	19.7612	9.6
9	1000.1 - 5000.0	49.6276	15.6
365	OVERALL	2.6412	

## OTHER CHECKS:

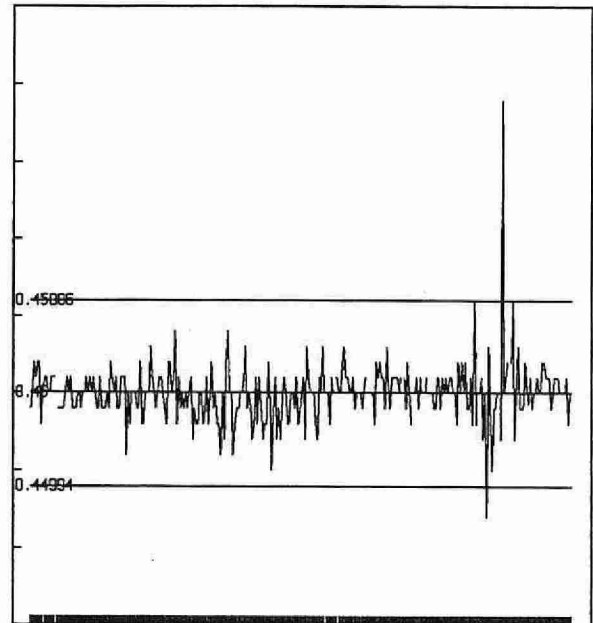
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	166	0.0208	0.2883

SOLIDS, SUSPENDED (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

**SOLIDS, SUSPENDED IGNITED**  
(Particulate Ash and Particulate Loss On Ignition)

**IDENTIFICATION:**

Laboratory Unit	Solids	Method Introduced	Before '61
Method Reference No.	E3188B	Units	mg/L
LIMS Product Code	SIGN3188	Supervisor	F. Lo
Sample Type/Matrix	Sewage, Industrial Waste		

**SAMPLING:**

Quantity Required	5-500 mL
Container	Glass or plastic

**ANALYTICAL PROCEDURE:**

The procedure for particulate solids (SS3188) is followed and the dried residue is ignited at  $600 \pm 50^{\circ}\text{C}$  for one hour in a muffle furnace. The dish is transferred to a desiccator to cool. The particulate ash (fixed solids) is the difference between the final ignited mass plus filter and the original tare weight of the filter, divided by the original sample volume (mL) used for SS3188. The particulate loss on ignition (estimate of volatile suspended solids) is the difference between the final ignited mass plus filter and the residue (suspended solids) plus filter, divided by the original sample volume (mL). Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

**INSTRUMENTATION:**

Balance (5 decimal places), muffle furnace, filters, Petri dishes  
Microcomputer system with appropriate software

**REPORTING:**

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
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**CONTROLS:**

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.

**NOTES:**

In June 1994, Solids method E3188B was written to include methods for all Solids fractions (Total, Suspended, Dissolved and Ignited) on sewage and industrial waste samples. The former methods which covered these techniques for all matrices, were discontinued ie., E3188A, E3190A, E3192A, and E3194A.



**SOLIDS, SUSPENDED IGNITED**  
(Particulate Ash and Particulate Loss On Ignition)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95

Laboratory Unit: Solids

**CALIBRATION CONTROL:**

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
C:	278	0.50	0.499998	-0.000002	0.000011
D:	278	0.05	0.049997	-0.000003	0.000011
C+D:	278	0.55	0.549995	-0.000005	0.000015
C-D:	278	0.45	0.450000	0.000000	0.000014

s.d.(AB)    S(between runs): 0.00001    Sw(within run): 0.00001    S/Sw: 1.0

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

0.54992 - 0.55008 for A+B  
0.44994 - 0.45006 for A-B

**SOLIDS, SUSPENDED IGNITED ( PARTICULATE ASH )**

**DUPLICATES:**

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
35	0 - 10.0	0.5665	143.7
44	10.1 - 50.0	1.3394	13.5
13	50.1 - 500.0	5.0801	27.6
38	500.1 - 1000.0	13.3531	2.0
36	1000.1 - 5000.0	23.6546	4.1
166	OVERALL	7.2191	

**OTHER CHECKS:**

	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	62	-0.3068	0.2369

**SOLIDS, SUSPENDED IGNITED**  
**(Particulate Ash and Particulate Loss On Ignition)**

**SOLIDS, SUSPENDED IGNITED ( PARTICULATE LOSS ON IGNITION )**

**DUPLICATES:**

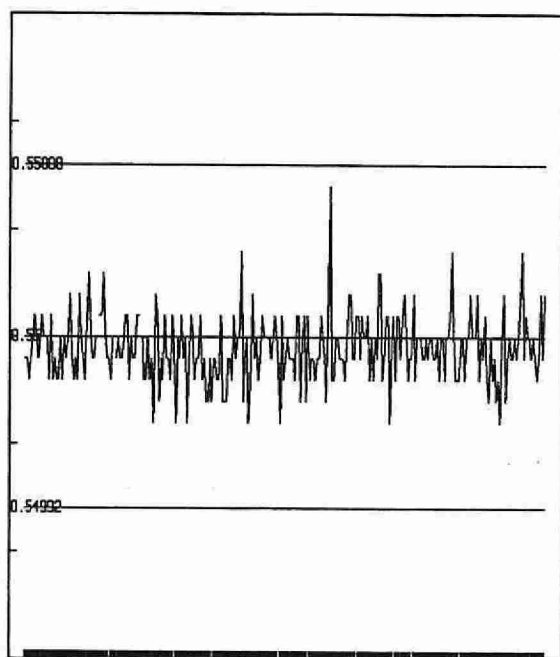
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
12	0 - 10.0	0.3988	6.8
45	10.1 - 50.0	1.4009	5.6
28	50.1 - 500.0	3.6710	5.4
4	500.1 - 1000.0	2.8693	0.3
78	1000.1 - 15000.0	29.9179	2.2
167	OVERALL	11.3822	

**OTHER CHECKS:**

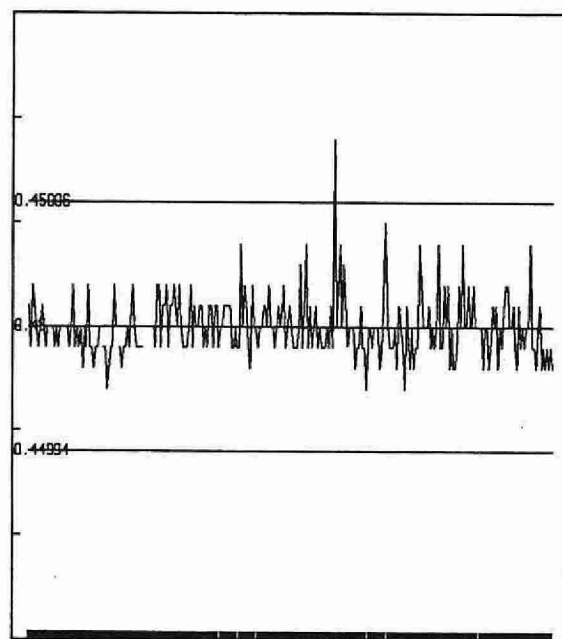
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	62	0.3900	0.1491

SOLIDS, SUSPENDED IGNITED (mg/L)  
(Particulate Ash and Particulate Loss On Ignition)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD C+D



QUALITY CONTROL STANDARD C-D

\_\_\_\_\_ CONTROL LIMIT

## SOLIDS, TOTAL

### IDENTIFICATION:

Laboratory Unit	Solids	Method Introduced	Before '81
Method Reference No.	E3188B	Units	mg/L or mg/Kg
LIMS Product Code	TSD3188,TS3188,TIGN3188	Supervisor	F. Lo
Sample Type/Matrix	Sewage, Industrial Waste		

### SAMPLING:

Quantity Required	125 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Generally, 100 mL aliquot of sample (alternate 50 mL) is pipetted into a preweighed Teflon dish, dried at 103-105°C, and stored in a desiccator for at least 24 hours. The total residue or solids content is calculated by subtracting the original dish mass from the dried dish mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

### INSTRUMENTATION:

Balance (5 decimal places), drying oven, dishes (Teflon).  
Microcomputer system with appropriate software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 2.0	Current T value: 10
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### CALIBRATION:

Balance zero  
Balance internal calibration performed daily.

### CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1

### NOTES:

In June 1994, Solids method E3188B was written to include methods for all Solids fractions (Total, Suspended, Dissolved and Ignited) on sewage and industrial waste samples. The former methods which covered these techniques for all matrices, were discontinued ie., E3188A, E3190A, E3192A, and E3194A.

# SOLIDS, TOTAL

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95

Laboratory Unit: Solids

CALIBRATION CONTROL: (QC data from TS3188 + TIGN3188)

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	247	50.00	49.99997	-0.00003	0.000075
B:	247	30.00	30.00009	0.00009	0.000060
A+B:	247	80.00	80.00006	0.00006	0.000120
A-B:	247	20.00	19.99988	-0.00012	0.000063

s.d.(AB) S(between runs): 0.000068 Sw(within run): 0.000044 S/Sw: 1.5

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

79.9996 - 80.0004 for A+B  
19.9997 - 20.0003 for A-B

RECOVERIES: (using 100 mL aliquot)

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
85	20000.0	20096.9	96.7
85	2000.0	2001.2	7.66

RECOVERIES: (using 50 mL aliquot)

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
85	20000.0	19928.2	87.3
85	2000.0	2001.7	25.5

DUPLICATES:

(using 100 mL aliquot)

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
50	0 - 1000	6.6614	4.3
20	1001 - 5000	45.3991	7.3
96	5001 - 25000	122.1038	2.1
64	25001 - 50000	305.0177	1.6
12	50001 - 125000	554.2048	3.4
242	Overall	141.0359	

# SOLIDS, TOTAL cont'd

## DUPLICATES:

(using 50 mL aliquot)

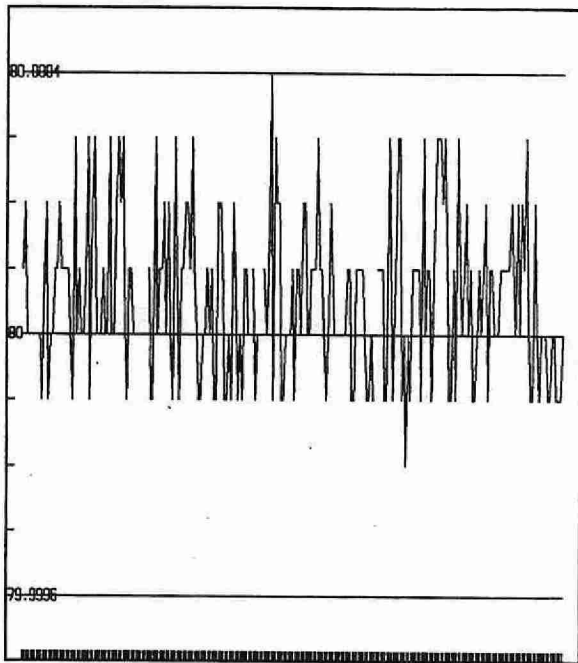
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
8	0 - 1000	3.7155	0.6
45	1001 - 5000	31.5705	1.3
43	5001 - 25000	85.8417	2.2
34	25001 - 85000	256.2377	0.7
130	Overall	98.2853	

## OTHER CHECKS:

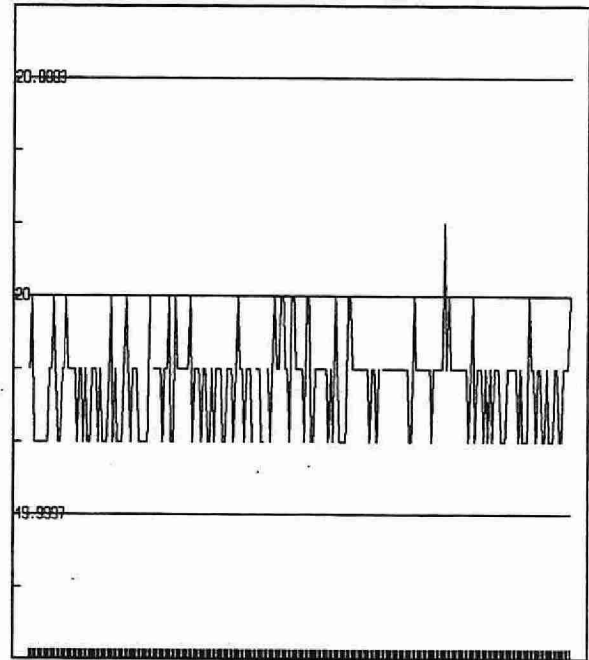
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank (using 100 mL aliquot)	86	0.2131	3.7543
Blank (using 50 mL aliquot)	51	1.4006	2.736

SOLIDS, TOTAL (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## SOLIDS, TOTAL

### IDENTIFICATION:

Laboratory Unit	Solids River	Method Introduced	Before '81
Method Reference No.	E3365A	Units	mg/L or mg/Kg
LIMS Product Code	TSD3365,TS3365	Supervisor	J. McBride
Sample Type/Matrix	Drinking Waters, Leachates,		

### SAMPLING:

Quantity Required	125 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Generally, 100 mL aliquot of sample (alternate 50 mL) is pipetted into a preweighed dish, dried at 103-105°C, and stored in a desiccator for at least 24 hours. The total residue or solids content is calculated by subtracting the original dish mass from the dried dish mass. Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

### INSTRUMENTATION:

Balance (5 decimal places), drying oven, dishes (Teflon).  
Microcomputer system with appropriate software.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 2.0	Current T value: 10
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### CALIBRATION:

Balance zero  
Balance internal calibration performed daily.

### CONTROLS:

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.
Recovery	2 standards, e.g. R1

### NOTES:

In June 1994, Solids method E3365A was written to include methods for all Solids fractions (Total, Suspended, and Dissolved) on surface and drinking waters. The former methods which covered these techniques for all matrices, were discontinued ie., E3188A, E3190A, and E3192A.



# SOLIDS, TOTAL

QUALITY CONTROL DATA FROM 01/01/94 TO 31/12/95

Laboratory Unit: River Solids

## CALIBRATION CONTROL: (1995)

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	134	50.00	50.00047	0.00047	0.000076
B:	134	30.00	30.00031	0.00031	0.000065
A+B:	134	80.00	80.00078	0.00078	0.000127
A-B:	134	20.00	20.00017	0.00017	0.000063

s.d.(AB) S(between runs): 0.000071 Sw(within run): 0.000045 S/Sw: 1.6

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

80.00045 - 80.00114 for A+B  
19.99994 - 20.00046 for A-B

## RECOVERIES: ('94 and '95 data combined)

Number of Data	Expected Concentration (mg/L)	Mean Concentration Measured (mg/L)	Standard Deviation (1)
38	20000.0	20020.66	79.3
40	2000.0	2001.02	14.2

## DUPLICATES: ('94 and '95 data combined)

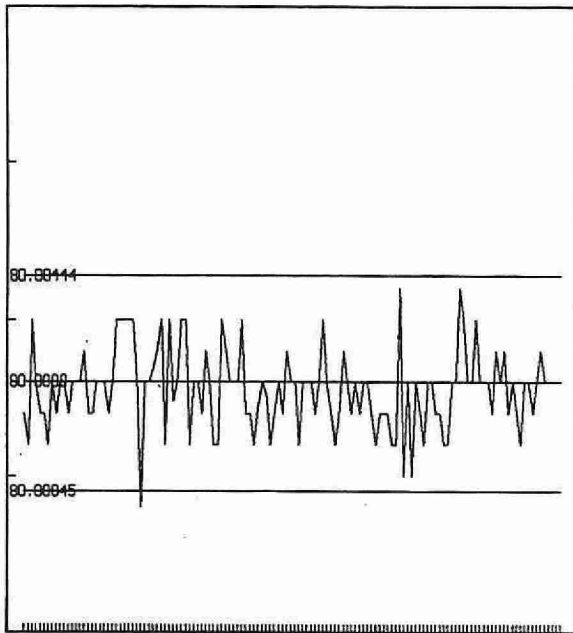
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
28	0 - 100.0	3.4412	7.1
10	100.1 - 200.0	6.5820	4.4
33	200.0 - 500.0	7.5392	3.4
9	500.1 - 2000.0	13.0174	1.2
80	OVERALL	6.7842	

## OTHER CHECKS: ('94 and '95 data combined)

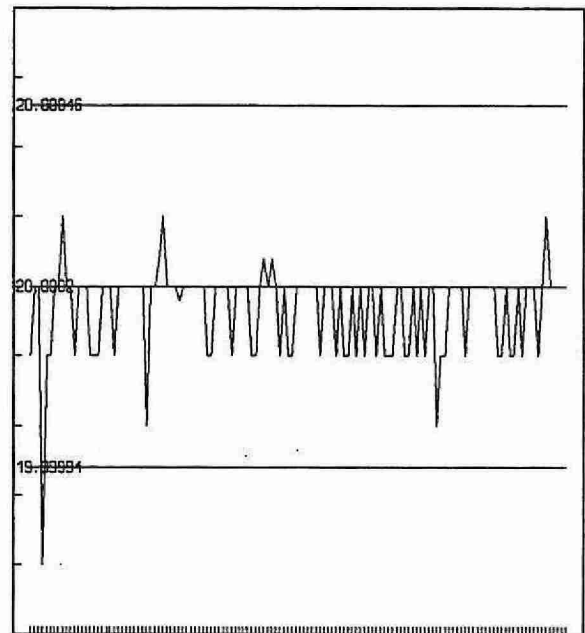
	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	42	3.1336	8.4654

SOLIDS, TOTAL (mg/L)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

**SOLIDS, TOTAL IGNITED**  
( Ash and Loss On Ignition)

**IDENTIFICATION:**

Laboratory Unit	Solids	Method Introduced	Before '61
Method Reference No.	E3188B	Units	mg/L
LIMS Product Code	TIGN3188	Supervisor	F. Lo
Sample Type/Matrix	Sewage, Industrial Waste		

**SAMPLING:**

Quantity Required	5-500 mL
Container	Glass or plastic

**ANALYTICAL PROCEDURE:**

The procedure for total solids (TS3188) is followed and the dried residue is ignited at  $600 \pm 50^{\circ}\text{C}$  for one hour in a muffle furnace. The dish is transferred to a desiccator to cool. The ash (fixed solids) is the difference between the final ignited mass plus filter and the original tare weight of the filter, divided by the original sample volume (mL) used for TS3188. The loss on ignition (estimate of volatile total solids) is the difference between the final ignited mass plus filter and the residue (total solids) plus filter, divided by the original sample volume (mL). Data collection, calculations, and transfer of results to LIMS are controlled by a microcomputer system.

**INSTRUMENTATION:**

Balance (5 decimal places), muffle furnace, filters, Petri dishes.  
Microcomputer system with appropriate software.

**REPORTING:**

Maximum Significant Figures: 3	Current W value: 2.0	Current T value: 10
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**CONTROLS:**

Calibration	2 S class weights, e.g. QCA (results in grams)
Drift	Balance is reset to zero after every 10 weighings by the microcomputer.

**NOTES:**

In June 1994, Solids method E3188B was written to include methods for all Solids fractions (Total, Suspended, Dissolved and Ignited) on sewage and industrial waste samples. The former methods which covered these techniques for all matrices, were discontinued ie., E3188A, E3190A, E3192A, and E3194A.

**SOLIDS, TOTAL IGNITED  
(Ash and Loss On Ignition)**

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95

Laboratory Unit: Solids

**CALIBRATION CONTROL:**

	n	Expected Mass (g)	Mean Mass Measured (g)	Mean Bias (g)	Standard Deviation (1)
A:	247	50.00	49.99997	-0.00003	0.000075
B:	247	30.00	30.00009	0.00009	0.000060
A+B:	247	80.00	80.00006	0.00006	0.000120
A-B:	247	20.00	19.99988	-0.00012	0.000063

s.d.(AB)    S(between runs): 0.000068    Sw(within run): 0.000044    S/Sw: 1.5

The calibration is accepted if the calibration control values obtained lie within the ranges expressed in grams:

79.9996    -    80.0004    for    A+B  
19.9997    -    20.0003    for    A-B

**SOLIDS, TOTAL IGNITED ( ASH )**

**DUPLICATES:**

n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
55	0 - 2000	10.9151	1.3
17	2001 - 5000	14.6217	0.8
26	5001 - 10000	49.9879	0.9
27	10001 - 25000	117.076	1.3
4	25001 - 50000	332.595	0.9
129	OVERALL	40.6717	

**OTHER CHECKS:**

Ashed	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	51	0.9576	3.1768

**SOLIDS, TOTAL IGNITED  
(Ash and Loss On Ignition)**

**SOLIDS, TOTAL IGNITED ( LOSS ON IGNITION )**

**DUPLICATES:**

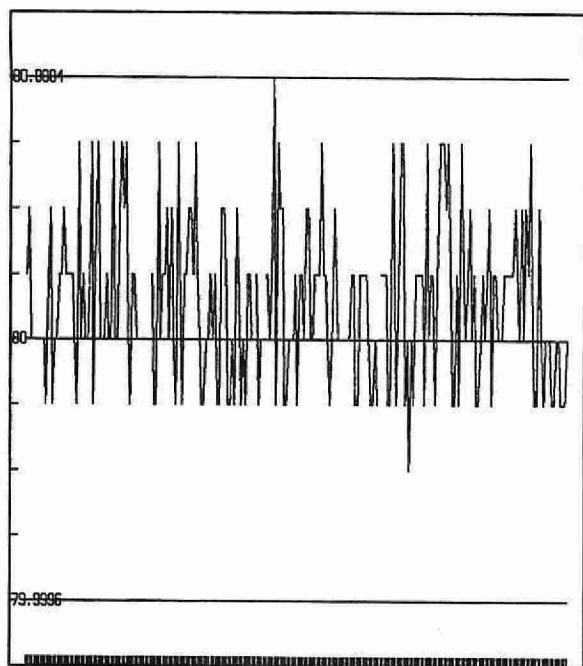
n Data Pairs	Sample Concentration Span (mg/L)	Standard Deviation (2)	Coefficient of variation(%)
27	0 - 2000	11.2907	1.2
35	2001 - 5000	46.0438	1.6
17	5001 - 10000	112.469	6.3
38	10001 - 25000	142.905	1.1
9	25001 - 50000	294.018	0.8
126	OVERALL	83.605	

**OTHER CHECKS:**

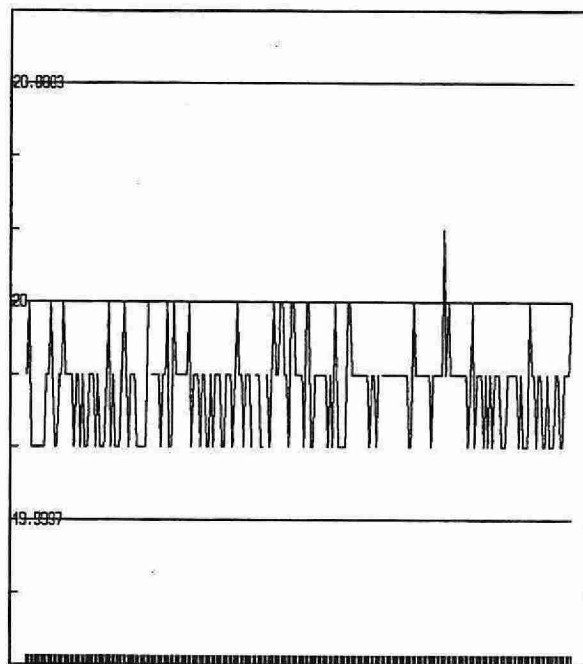
LOI	n	Data Mean (mg/L)	Standard Deviation (1)
Blank	51	0.4459	3.2807

SOLIDS, TOTAL IGNITED (mg/L)  
(Particulate Ash and Loss on Ignition)

QUALITY CONTROL DATA FROM 01/01/95 TO 31/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## SULPHATE

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	01/04/78
Method Reference No.	E3147A	Units	mg/L as SO <sub>4</sub>
LIMS Product Code	ANION3147	Supervisor	J. McBride
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

### SAMPLING:

Quantity Required	15 mL
Container	Glass or Plastic

### ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with Na<sub>2</sub>CO<sub>3</sub>/NaHCO<sub>3</sub> to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO<sub>4</sub> is determined by the comparison of the sample peak heights to a series of standards.

Chloride is determined simultaneously.

### INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g., QCA
Drift	1 standard every 10 samples.

# SULPHATE

QUALITY CONTROL DATA FROM 04/01/95 TO 27/12/95

Laboratory Unit: Dorset

Full Scale: to 10.0 mg/L as SO<sub>4</sub>

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	38	8.0	7.988	-0.012	0.0619
B:	38	2.0	1.999	-0.001	0.0307
A+B:	38	10.0	9.984	-0.016	0.0822
A-B:	38	6.0	5.989	-0.011	0.0535

s.d.(AB) S(between runs): 0.049

Sw(within run): 0.038

S/Sw: 1.3

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.70 - 10.30 for A+B

5.84 - 6.16 for A-B

## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
18	0.00 - 1.00	0.0169	5.6
11	1.01 - 2.00	0.0519	5.7
28	2.01 - 5.00	0.0551	1.4
56	5.01 - 10.0	0.0730	1.1
113	Overall	0.0573	

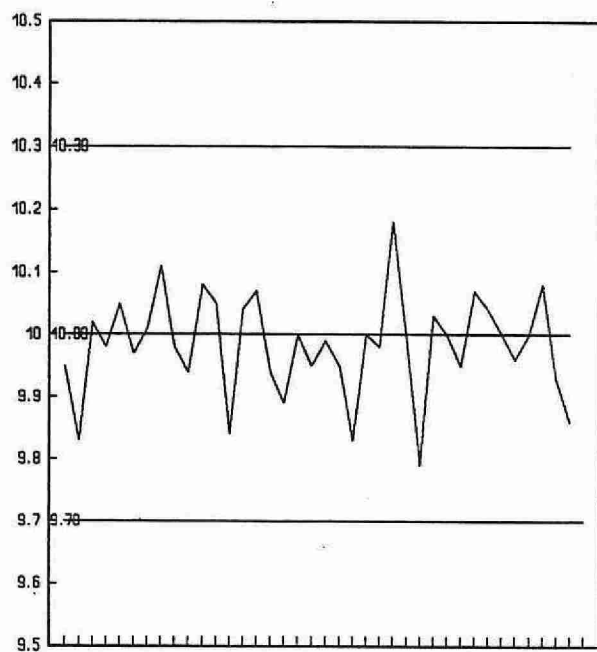
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	38	0.0029	0.0174

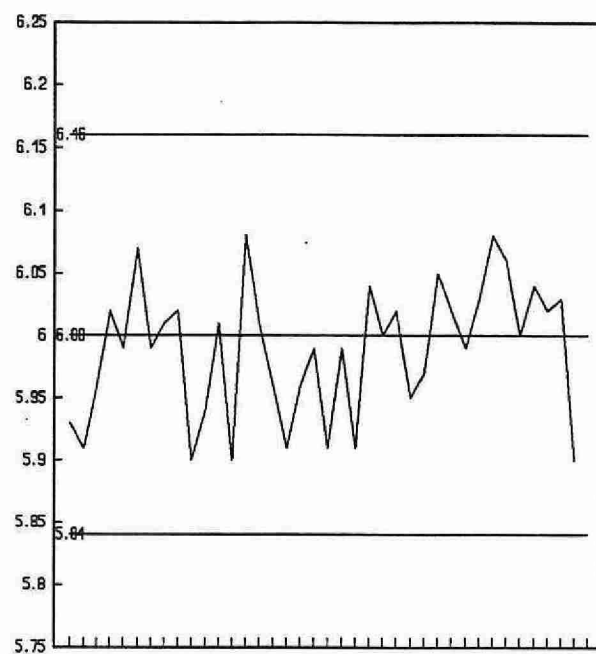


SULPHATE (mg/L as SO<sub>4</sub>)

QUALITY CONTROL DATA FROM 04/01/95 TO 27/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## SULPHATE

### IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3148A	Units	µg/Filter as SO <sub>4</sub>
LIMS Product Code	LOV3148, ANLOV3148, TEF3148, NYL3148, SDIO3148, ANION3148	Supervisor	F. Lo
Sample Type/Matrix	W40 filters from LoVol filter packs. Teflon filters from Sequential filter packs. Nylon and W41 filters from both LoVol and Sequential filter packs.		

### SAMPLING:

Quantity Required	1 filter for W40, Teflon or Nylon. 1 set of 2 W41 filters
Container	50 mL polypropylene tube
Other	For W41 filters, filters are impregnated with potassium carbonate / glycerol solution

### SAMPLE PREPARATION:

Filters are extracted with 50.0 mL of DDW (W40) or 25.0 mL of DDW (Teflon) or 25.0 mL of 0.03 N NaOH (Nylon) in polypropylene tubes with ultrasonic treatment followed by a 24 hour rest period. For W41 filters, filters are extracted with 50.0 mL of 0.05% H<sub>2</sub>O<sub>2</sub> in polypropylene tubes with one hour of mechanical shaking, followed by ultrasonic treatment to enhance extraction, then a 24 hour rest period. SO<sub>2</sub> is converted to SO<sub>4</sub> in the process.

### ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with Na<sub>2</sub>CO<sub>3</sub>/NaHCO<sub>3</sub> to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO<sub>4</sub> is determined by the comparison of the sample peak heights to a series of standards. Results are converted to µg/filter as SO<sub>4</sub> for W40, Teflon and Nylon filters. As for W41 filters, results are converted to µg/filter as SO<sub>2</sub>. Chloride and nitrogen-nitrate are determined simultaneously.

### INSTRUMENTATION:

Mechanical shaker, Ultrasonic bath, modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing and partial data processing.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.02 mg/L	Current T value: 0.1 mg/L
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### CALIBRATION:

BL plus 9 standards

## SULPHATE cont'd

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

### NOTES:

Detection criterion is based on duplicate analyses of the extract from one filter because duplicate filters are not received. To convert unit from mg/L to  $\mu\text{g}/\text{Filter}$ , multiply the concentration of  $\text{SO}_4$  in mg/L by 50 for W40 filters or 25 for Teflon or Nylon filters or 33.3 for W41 filters.

# SULPHATE

QUALITY CONTROL DATA FROM 13/01/95 TO 26/10/95

Laboratory Unit: Ion Chromatography

Full Scale: to 10.0 mg/L as SO<sub>4</sub>

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	29	8.0	8.048	0.048	0.0488
B:	29	2.0	2.005	0.005	0.0194
A+B:	29	10.0	10.054	0.054	0.0575
A-B:	29	6.0	6.043	0.043	0.0470

s.d.(AB)      S(between runs):      0.037      Sw(within run):      0.033      S/Sw: 1.1

The calibration is accepted if the calibration control values obtained lie within the ranges:

9.68      -      10.32      for      A+B  
5.76      -      6.24      for      A-B

## DUPLICATES:

For W40 filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
5	0 - 2.00	0.0094	1.0
21	2.01 - 5.00	0.0134	0.5
3	5.01 - 10.00	0.0250	0.4
29	Overall	0.0144	

For Teflon filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
18	0 - 1.00	0.0085	1.9
15	1.01 - 2.00	0.0208	1.5
16	2.01 - 5.00	0.0199	0.6
3	5.01 - 10.00	0.0166	0.4
52	Overall	0.0157	

# SULPHATE

QUALITY CONTROL DATA FROM 13/01/95 TO 26/10/95

Laboratory Unit: Ion Chromatography

Full Scale: to 10.0 mg/L as SO<sub>4</sub>

For Nylon filters:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
50	0 - 1.00	0.0202	6.3
10	1.01 - 2.00	0.0281	1.9
13	2.01 - 5.00	0.0516	1.7
1	5.01 - 10.00	N.A.	N.A.
74	Overall	0.0248	

For W41 filters:

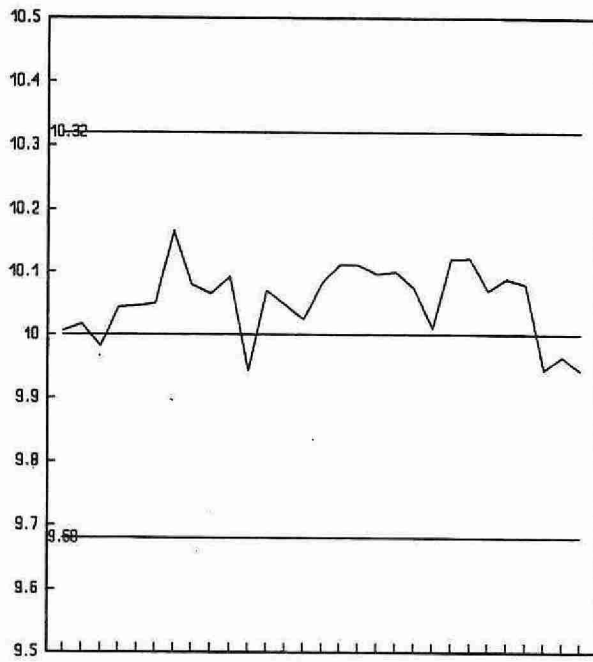
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
40	0 - 1.00	0.0075	7.8
10	1.01 - 2.00	0.0110	0.8
17	2.01 - 5.00	0.0397	1.4
5	5.01 - 10.00	0.0691	0.8
72	Overall	0.0200	

## OTHER CHECKS:

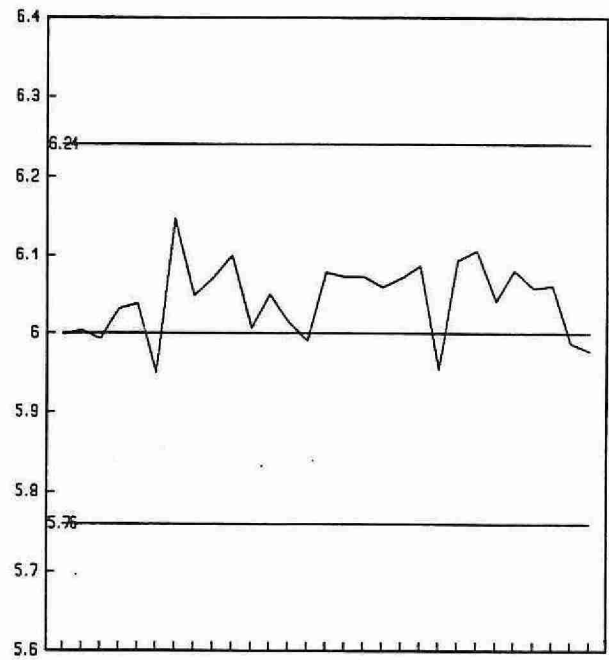
	n	Mean	Standard Deviation (1)
Long Term Blank	29	0.0018	0.0095

SULPHATE (mg/L as SO<sub>4</sub>)

QUALITY CONTROL DATA FROM 13/01/95 TO 26/10/95



QUALITY CONTROL STANDARD A+B



## SULPHATE

### IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/82
Method Reference No	E3172A	Units	mg/L as SO <sub>4</sub>
LIMS Product Code	SULP3172	Supervisor	F. Lo
Sample Type/Matrix	Rivers, Lakes, Domestic Waters, Leachates, Soil Extracts, Effluents		

### SAMPLING:

Quantity Required	50 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the samples by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. The concentration of sulphate in mg/L as SO<sub>4</sub> is determined by comparison of the sample scan to a series of standard scans.

### INSTRUMENTATION:

Basic modular continuous flow ion chromatographic system plus control module (in-house design) for automated sample introduction and timing.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.5	Current T value: 2.5
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### CALIBRATION:

BL plus 10 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

# SULPHATE

QUALITY CONTROL DATA FROM 05/01/95 TO 21/12/95

Laboratory Unit: Ion Chromatography

Full Scale: to 100.0 mg/L as SO<sub>4</sub>

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	73	80.0	80.4	0.4	0.9812
B:	73	20.0	19.7	-0.3	0.5755
A+B:	73	100.0	100.1	0.1	1.3253
A-B:	73	60.0	60.7	0.7	0.9117

s.d.(AB) S(between runs): 0.80

Sw(within run): 0.64

S/Sw: 1.2

The calibration is accepted if the calibration control values obtained lie within the ranges:

97.2 - 102.8 for A+B  
57.9 - 62.1 for A-B

## DUPLICATES:

n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
38	0.0 - 10.0	0.3485	6.5
32	10.1 - 20.0	0.3966	2.5
94	20.1 - 50.0	0.6968	2.8
18	50.1 - 100.0	0.7065	2.2
182	Overall	0.6756	

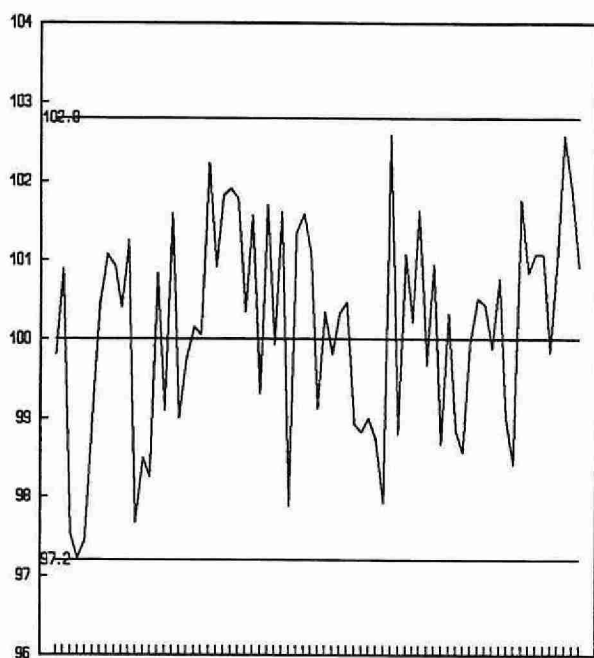
## OTHER CHECKS:

	n	Mean	Standard Deviation (1)
Long Term Blank	73	0.4273	0.5137

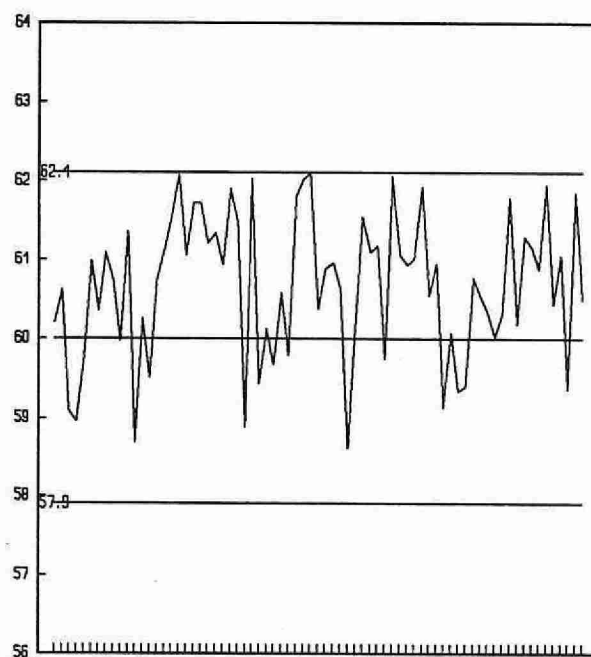


SULPHATE (mg/L as SO<sub>4</sub>)

QUALITY CONTROL DATA FROM 05/01/95 TO 21/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## SULPHATE

### IDENTIFICATION:

Laboratory Unit	Ion Chromatography	Method Introduced	01/04/78
Method Reference No	E3372A	Units	mg/L as SO <sub>4</sub>
LIMS Product Code	ANION3372	Supervisor	F. Lo
Sample Type/Matrix	Precipitation, Throughfall, Stemflow		

### SAMPLING:

Quantity Required	15 mL
Container	Glass or plastic

### ANALYTICAL PROCEDURE:

Sulphate is separated from other anions in the sample by automated suppressed ion chromatography using an eluent mixture of 0.003 M sodium bicarbonate and 0.0024 M sodium carbonate with conductivity detection. Samples are spiked with Na<sub>2</sub>CO<sub>3</sub>/NaHCO<sub>3</sub> to match the eluent strength and maintain background conductivity. The concentration of sulphate in mg/L as SO<sub>4</sub> is determined by the comparison of the sample peak heights to a series of standards.

Chloride and nitrogen-nitrate are determined simultaneously.

### INSTRUMENTATION:

Modular continuous flow ion chromatographic system plus microcomputer for automated sample injection, timing, and partial data processing.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.05	Current T value: 0.25
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### CALIBRATION:

BL plus 7 standards

### CONTROLS:

Calibration	LTBL plus 2 standards, e.g. QCA
Drift	1 standard every 10 samples

### NOTES:

Same analytical method as E3147A operating in Dorset Lab. New method number introduced for Toronto Lab in 1993 is E3372A.

# SULPHATE

QUALITY CONTROL DATA FROM 12/01/95 TO 21/12/95

Laboratory Unit: Ion Chromatography

Full Scale: to 5.0 mg/L as SO<sub>4</sub>

## CALIBRATION CONTROL:

	n	Expected Concentration	Mean Concentration	Mean Bias	Standard Deviation (1)
A:	20	4.00	3.999	-0.001	0.0365
B:	20	1.00	1.003	0.003	0.0113
A+B:	20	5.00	5.003	0.003	0.0372
A-B:	20	3.00	2.996	-0.004	0.0391

s.d.(AB)

S(between runs): 0.027

Sw(within run): 0.028

S/Sw: 0.98

The calibration is accepted if the calibration control values obtained lie within the ranges:

4.79 - 5.21 for A+B  
2.84 - 3.16 for A-B

## DUPLICATES:

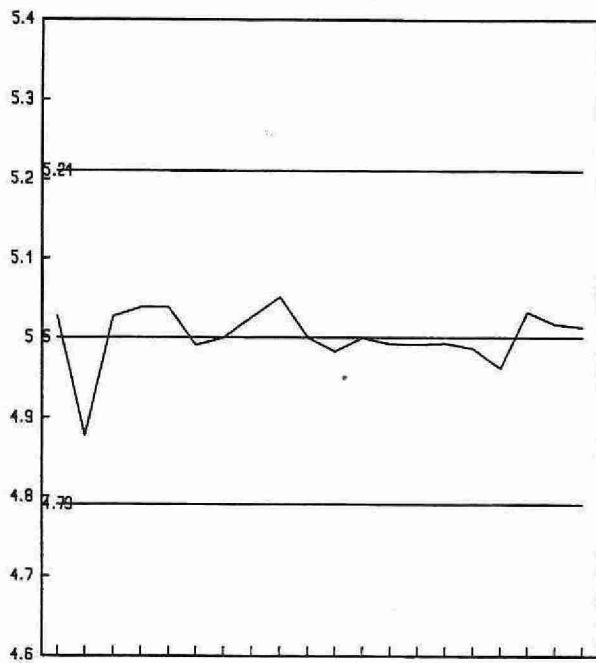
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
8	0.00 - 1.00	0.0057	1.8
16	1.01 - 2.50	0.0282	1.6
4	2.50 - 5.00	0.0476	1.0
28	Overall	0.0246	

## OTHER CHECKS:

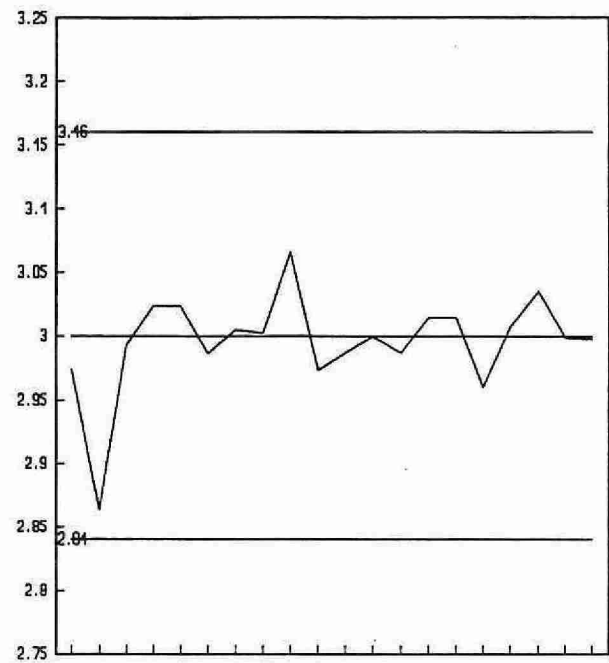
	n	Mean	Standard Deviation (1)
Long Term Blank	20	0.000	0.0000

SULPHATE (mg/L as SO<sub>4</sub>)

QUALITY CONTROL DATA FROM 12/01/95 TO 21/12/95



QUALITY CONTROL STANDARD A+B



QUALITY CONTROL STANDARD A-B

CONTROL LIMIT

## TURBIDITY

### IDENTIFICATION:

Laboratory Unit:	Colourimetry	Method Introduced:	Before '74
Method Reference No:	E3311A	Units:	FTU
LIMS Product Code:	TURB3311	Supervisor:	J. McBride
Sample Type/Matrix:	Rivers, Lakes, Effluents, Drinking Water, Industrial Waste, Sewage		

### SAMPLING:

Quantity Required:	50 mL
Container:	Glass or plastic

### ANALYTICAL PROCEDURE:

The instrument is standardized with sealed standards which are prepared commercially and rated in Formazin Turbidity Units. Samples are placed in the turbidimeter, and results in FTU are read directly from the digital output. Turbidity measurement are based on light scattering at 90 plus or minus 30 degrees of rotation. The instrument compensates for sample colour.

### INSTRUMENTATION:

-Hach Ratio/XR Model Turbidimeter modified to accept control signals from robot controller, electronic interphase, Zymark ZYMATE 11 Laboratory Robot System, IBM PC computer.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.01	Current T value: 0.05
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### CALIBRATION:

BL plus formazin standards (once every four months)

### CONTROLS:

Calibration:	5 standards, e.g. QCA
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# TURBIDITY

## QUALITY CONTROL DATA FROM 05/01/95 TO 22/12/95

Laboratory Unit: Colourimetry

Full Scale: to 2000 FTU

CALIBRATION CONTROL: FROM 05/01/95 TO 22/06/95 (A,B,C)  
FROM 05/01/95 TO 07/07/95 (D)

	n	Expected Concentration	Mean Concentration	Standard Deviation (1)
A:	87	2.0	1.22	0.0408
B:	87	20.0	13.91	0.1102
C:	87	200.0	171.69	1.8460
D:	96	2000.0	1416.45	6.8470

On any given day the calibration is accepted if the values obtained lie within the ranges:

1.007	-	1.339	for	A
13.22	-	14.16	for	B
166.7	-	175.7	for	C
1407	-	1447	for	D

CALIBRATION CONTROL: FROM 26/06/95 TO 22/12/95 (A,B,C)  
FROM 12/07/95 TO 22/12/95 (D)

	n	Expected Concentration	Mean Concentration	Standard Deviation (1)
A:	102	2.0	1.396	0.0238
B:	102	20.0	14.607	0.1201
C:	102	200.0	150.872	2.0460
D:	93	2000.0	1445.602	8.2858

On any given day the calibration is accepted if the values obtained lie within the ranges:

1.185	-	1.517	for	A
13.85	-	14.79	for	B
147.9	-	156.9	for	C
1429	-	1469	for	D

### OTHER CHECKS:

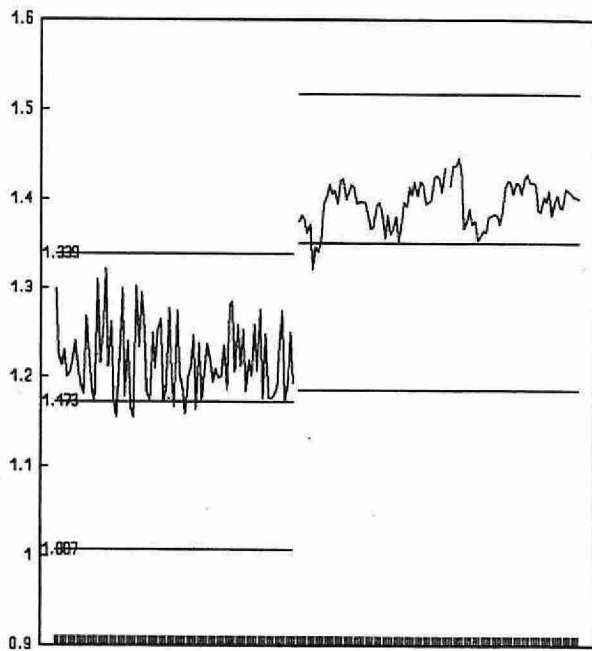
	n	Data Mean	Standard Deviation (1)
Stray Light	189	0.0478	0.0037

### DUPLICATES:

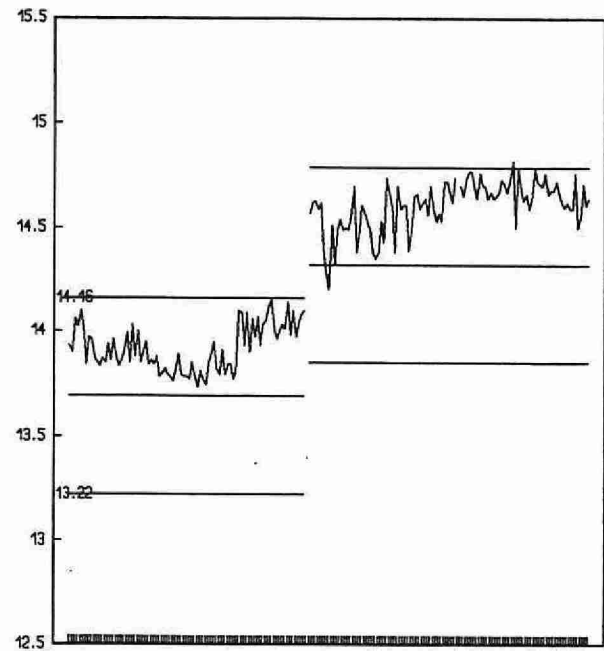
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
235	0.0 - 2.0	0.0521	15.7
134	2.1 - 20.0	0.6232	15.9
31	21.0 - 200	3.1333	34.7
3	201 - 2000	14.430	1.8
403	Overall	0.2483	

# TURBIDITY (FTU)

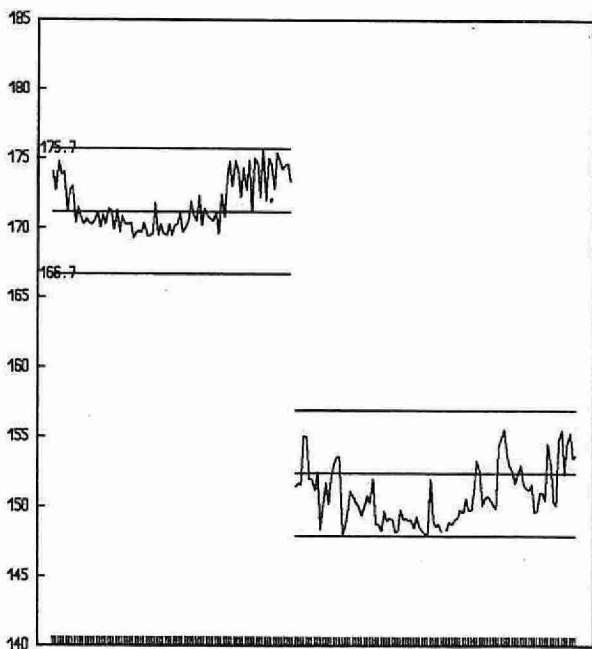
QUALITY CONTROL DATA FROM 05/01/95 TO 22/12/95



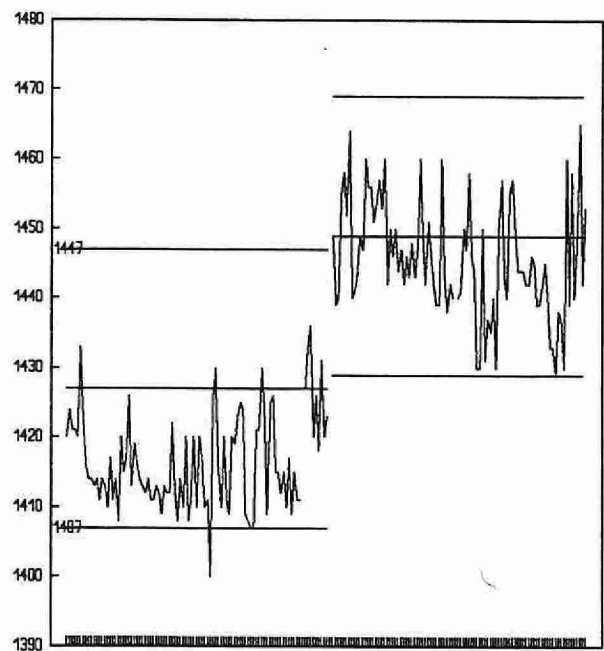
QUALITY CONTROL STANDARD A



QUALITY CONTROL STANDARD B



QUALITY CONTROL STANDARD C



QUALITY CONTROL STANDARD D

CONTROL LIMIT

## ZINC, TOTAL

### IDENTIFICATION:

Laboratory Unit	Dorset	Method Introduced	1991
Method Reference No.	E3376A	Units	µg/L as Zn
LIMS Product Code	3376METGF	Supervisor	J. McBride
Sample Type/Matrix	Surface waters, precipitation		

### SAMPLING:

Quantity Required	5 mL
Container	Glass or plastic, capped, acidified to 0.25% with HNO <sub>3</sub>

### ANALYTICAL PROCEDURE:

Samples are analyzed by GFAAS at 213.9 nm.  
Approximate absorbance: 0.8 at full scale level

### INSTRUMENTATION:

Varian graphite furnace atomic absorption spectrometer with automated sampler.

### REPORTING:

Maximum Significant Figures: 3	Current W value: 0.001	Current T value: 0.005
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### CALIBRATION:

BL plus 5 standards

### CONTROLS:

Calibration	1 NRC sample, 1 QCA
Drift	1 standard every 10 samples



# ZINC, TOTAL

QUALITY CONTROL DATA FROM 26/01/95 TO 12/12/95

Laboratory Unit: Dorset

Full Scale: to 20 µg/L as Zn

## CALIBRATION CONTROL:

	n	Mean Concentration	Standard Deviation (1)
QCA:	13	2.55	0.0625
NRC:	14	3.33	0.0384

## DUPLICATES:

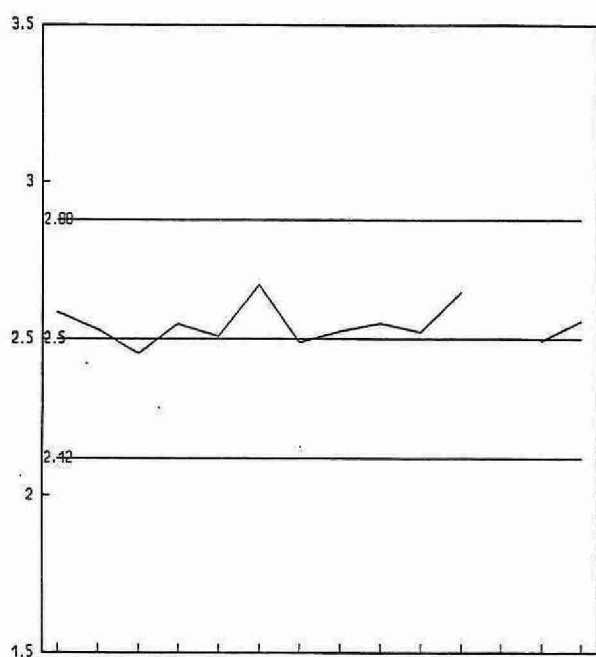
n Data Pairs	Sample Concentration Span	Standard Deviation (2)	Coefficient of variation(%)
8	0.0 - 2.0	0.0415	30.1
13	2.1 - 4.0	0.2231	9.9
6	4.1 - 10.0	0.4087	6.8
0	10.1 - 20.0	N.A.	N.A.
27	Overall	0.2414	

## OTHER CHECKS:

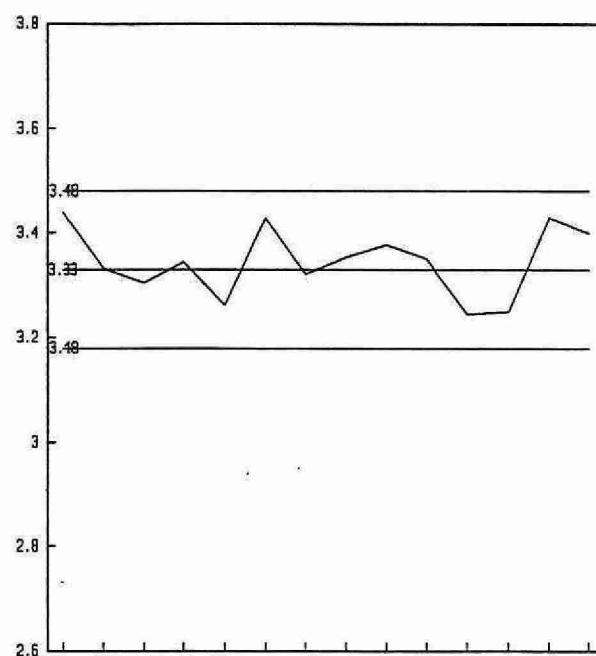
	n	Mean	Standard Deviation (1)
LTB	14	0.0449	0.0384

# ZINC, TOTAL ( $\mu\text{g/L}$ )

QUALITY CONTROL DATA FROM 26/01/95 TO 12/12/95



QUALITY CONTROL STANDARD A



NRC REFERENCE SAMPLE

CONTROL LIMIT

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## ABBREVIATIONS

AAS	- Atomic Absorption Spectrophotometer
Bl	- Blank
BOD	- Biochemical Oxygen Demand
°C	- Degree Centigrade
cm	- Centimetre
Date	- Day/Month/Year
DDW	- Deionized distilled water
DO	- Dissolved oxygen
DW	- Distilled water
EDTA	- Ethylenediaminetetraacetate
EPA	- Environmental Protection Agency
FTU	- Formazin Turbidity Units
g	- Gram
GFAAS	- Graphite Furnace Atomic Absorption Spectrometer
IR	- Infrared
L	- Litre
LAB	- Laboratory
LIMS	- Laboratory Information Management System
LTB(L)	- Long Term Blank
M	- Molar
meq	- Milliequivalent
mg	- Milligram
min	- Minute
mL	- Millilitre
mm	- Millimetre
N.A.	- Not Available or Not Applicable
nm	- Nanometre
NRC	- National Research Council
Pure-DW	- Pure Deionized Water
QC	- Quality Control
QCA	- Quality Control Standard A
QCB	- Quality Control Standard B
QCC	- Quality Control Standard C
QCD	- Quality Control Standard D
R	- Recovery
rpm	- Revolutions per minute

## ABBREVIATIONS cont'd

S	- Between run standard deviation
$S_1$	- Standard Deviation (Conventional)
$S_2$	- Standard Deviation for duplicates
$S_w$	- Within run standard deviation
S Class	- Weight classification designation (not certified)
s.d.	- Standard deviation
STD	- Standard
TCU	- True Colour Units
$\mu\text{m}$	- Micrometer
$\mu\text{eq}$	- Microequivalent
$\mu\text{g}$	- Microgram
$\mu\text{S}$	- Micro-Siemen
UV	- Ultra-Violet
V/V	- Concentration based on volume measurements

## APPENDIX A

### W & T :

W and T are low level data qualifiers assigned to data that are near or below the detection limit values (3)(8). The code <W indicates that no measurable response was observed under the test conditions. The reported value indicates the minimum amount of analyte that could have been measured under routine conditions. W is usually less than the standard deviation of duplicates near zero. The <T code is used to represent a measurable amount of the analyte which under the test conditions is not verifiable. The reported result should be used only for large batches of similar data to evaluate background levels or trends of contaminants in the environment where more sensitive analytical methods are not available.

To provide a consistent Laboratory Services Branch approach to data reporting, the Water Quality Analyses Section calculates W from the standard deviation of duplicates ( $S_2$ ), near zero, by rounding down to the nearest 1, 2 or 5 digit. T is five times W. W and T values for this report are summarized in Appendix B.

# APPENDIX B

## W AND T VALUES FOR DATA REPORTED IN 1995

PARAMETER	UNITS	METHOD REFERENCE NO.	FULL SCALE	W	T
Acidity, Gran	µg/L H <sup>+</sup>	E3248A	1000	1.0	5.0
Acidity, Total Fixed Endpoint	mg/L CaCO <sub>3</sub>	E3248A	100	0.05	0.25
Alkalinity, Gran	mg/L CaCO <sub>3</sub>	E3042A	25		
Total Fixed Endpoint 4.5	mg/L CaCO <sub>3</sub>	E3042A	100	0.05	0.25
	mg/L CaCO <sub>3</sub>	E3218A	1000	0.2	1.0
	mg/L CaCO <sub>3</sub>	E3228A	1000	0.5	2.5
	mg/L CaCO <sub>3</sub>	E3289A	1000	0.2	1.0
Total Fixed Endpoint 3.8	mg/L CaCO <sub>3</sub>	E3042A	100	0.05	0.25
Aluminum, Reactive Species	µg/L as Al	E3375A	1000	2	10
Total	µg/L as Al	E3300A	1000	2	10
Cadmium, Total	µg/L as Cd	E3376A	5	0.001	0.005
Calcium,	mg/L as Ca	E3146A	2	0.005	0.025
	mg/L as Ca	E3171A	40	0.05	0.25
	mg/L as Ca	E3217A	200	0.2	1
	mg/L as Ca	E3249A	8	0.02	0.1
Carbon, Dissolved Inorganic	mg/L as C	E3028A	10	0.02	0.1
	mg/L as C	E3370A	80	0.2	1
Carbon, Dissolved Organic	mg/L as C	E3370A	20	0.1	0.5
Carbon, Total Organic	mg/L as C	E3247B	25	0.2	1
Carbon, Total Particulate	mg/L as C	E3141A	100	0.2	1
Chloride	mg/L as Cl	E3016A	100	0.2	1
	mg/L as Cl	E3147A	2	0.01	0.05
	µg/filt as Cl	E3148A	100	1	5
	mg/L as Cl	E3372A	1	0.01	0.05
Chlorine, Total Residual	µg/L as Cl <sub>2</sub>	E3309A	50	2	10
Chlorophyll "a"	µg/L	E3169A	50	0.2	1
Chlorophyll "a" acidified	µg/L	E3169A	10	1	5
Chlorophyll "b"	µg/L	E3169A	10	0.1	0.5
Colour, True	TCU	E3025A	100	0.2	1
	TCU	E3219A	100	0.2	1

## APPENDIX B

## W AND T VALUES FOR DATA REPORTED IN 1995

PARAMETER	UNITS	METHOD REFERENCE NO.	FULL SCALE	W	T
Conductivity	µS/cm	E3024B	500	0.2	1
	µS/cm	E3177A	100	0.2	1
	µS/cm	E3218A	2000	1	5
	µS/cm	E3228A	10000	5	25
	µS/cm	E3289A	2000	1	5
Copper, Total	µg/L as Cu	E3376A	10	0.003	0.015
Cyanide, Free	mg/L as Cn	E3014A	0.2	0.001	0.005
Cyanide, Total	mg/L as Cn	E3015A	0.2	0.001	0.005
Fluoride	µg/L as F	E3041A	70	0.2	1.0
	mg/L as F	E3369A	2	0.01	0.05
Hardness	mg/L as CaCO <sub>3</sub>	E3171A		0.2	1.0
	mg/L as CaCO <sub>3</sub>	E3217A		0.5	2.5
	mg/L as CaCO <sub>3</sub>	E3249A		0.05	0.25
Iron, Total	µg/L as Fe	E3303B	1000	2	10
Lead, Total	µg/L as Pb	E3376A	10	0.003	0.015
Magnesium	mg/L as Mg	E3146A	0.5	0.001	0.005
	mg/L as Mg	E3171A	10	0.02	0.1
	mg/L as Mg	E3217A	50	0.05	0.25
	mg/L as Mg	E3249A	2	0.005	0.025
Manganese, Total	µg/L	E3303B	200	1	5
Nitrogen, Ammonia plus Ammonium	mg/L as N	E3149A	2	0.002	0.01
	µg/filt as N	E3149A	50	0.05	0.25
	mg/L as N	E3364A	2	0.002	0.01
	mg/L as N	E3366A	50	0.05	0.25
	µg/L as N	E3374A	1000	1	5
Nitrogen, Nitrate	µg/filt as N	E3148A	(W40) 100	0.5	2.5
	µg/filt as N	E3148A	(Nylon) 50	0.2	1
	µg/filt as N	E3148A	(Teflon) 50	0.2	1
	mg/L as N	E3372A	1	0.01	0.05
Nitrogen, Nitrate plus Nitrite	mg/L as N	E3364A	5	0.005	0.025
	mg/L as N	E3366A	50	0.05	0.25
	mg/L as N	E3369A	20	0.1	0.5
	µg/L as N	E3374	1000	2.0	10



# APPENDIX B

## W AND T VALUES FOR DATA REPORTED IN 1995

PARAMETER	UNITS	METHOD REFERENCE NO.	FULL SCALE	W	T
Nitrogen, Nitrite . . . . .	mg/L as N . . . . .	E3364A . . . . .	0.2 . . . . .	0.001 . . . . .	0.005 . . . . .
. . . . .	mg/L as N . . . . .	E3366A . . . . .	2 . . . . .	0.005 . . . . .	0.025 . . . . .
Nitrogen, Total Kjeldahl . . . . .	mg/g as N . . . . .	E3116A . . . . .	20 . . . . .	0.1 . . . . .	0.5 . . . . .
. . . . .	mg/g as N . . . . .	E3118A . . . . .	20 . . . . .	0.2 . . . . .	1.0 . . . . .
. . . . .	mg/L as N . . . . .	E3367A . . . . .	2 . . . . .	0.02 . . . . .	0.1 . . . . .
. . . . .	mg/L as N . . . . .	E3368A . . . . .	50 . . . . .	0.05 . . . . .	0.25 . . . . .
Oxygen Demand, Biochemical . . . . .	mg/L as O . . . . .	E3182A . . . . .	9 . . . . .	0.2 . . . . .	1.0 . . . . .
Oxygen Demand, Chemical . . . . .	mg/L as O . . . . .	E3170A . . . . .	40 . . . . .	1.0 . . . . .	5.0 . . . . .
. . . . .	mg/L as O . . . . .	E3246A . . . . .	500 . . . . .	2.0 . . . . .	10 . . . . .
pH . . . . .	. . . . .	E3042A . . . . .	14 . . . . .	. . . . .	. . . . .
. . . . .	. . . . .	E3218A . . . . .	14 . . . . .	. . . . .	. . . . .
. . . . .	. . . . .	E3228A . . . . .	14 . . . . .	. . . . .	. . . . .
. . . . .	. . . . .	E3248A . . . . .	14 . . . . .	. . . . .	. . . . .
. . . . .	. . . . .	E3289A . . . . .	14 . . . . .	. . . . .	. . . . .
Phenolics, Reactive . . . . .	µg/L Phenol . . . . .	E3179A . . . . .	50 . . . . .	0.2 . . . . .	1.0 . . . . .
Phosphorus, Reactive ortho-Phosphate . . . . .	mg/L as P . . . . .	E3364A . . . . .	0.1 . . . . .	0.0005 . . . . .	0.0025 . . . . .
. . . . .	mg/L as P . . . . .	E3366A . . . . .	10 . . . . .	0.02 . . . . .	0.1 . . . . .
Phosphorus, Total . . . . .	µg/L as P . . . . .	E3036A . . . . .	100 . . . . .	0.2 . . . . .	1.0 . . . . .
. . . . .	mg/g as P . . . . .	E3116A . . . . .	5 . . . . .	0.02 . . . . .	1.0 . . . . .
. . . . .	mg/g as P . . . . .	E3118A . . . . .	8 . . . . .	0.02 . . . . .	0.1 . . . . .
. . . . .	mg/L as P . . . . .	E3367A . . . . .	0.2 . . . . .	0.002 . . . . .	0.01 . . . . .
. . . . .	mg/L as P . . . . .	E3368A . . . . .	10 . . . . .	0.02 . . . . .	0.1 . . . . .
Potassium, . . . . .	µg/filt as K . . . . .	E3146A . . . . .	50 . . . . .	0.1 . . . . .	0.5 . . . . .
. . . . .	mg/L as K . . . . .	E3146A . . . . .	1 . . . . .	0.002 . . . . .	0.010 . . . . .
. . . . .	mg/L as K . . . . .	E3171A . . . . .	5 . . . . .	0.01 . . . . .	0.05 . . . . .
. . . . .	mg/L as K . . . . .	E3217A . . . . .	25 . . . . .	0.05 . . . . .	0.25 . . . . .
. . . . .	mg/L as K . . . . .	E3249A . . . . .	1 . . . . .	0.005 . . . . .	0.025 . . . . .
Silicon, Reactive Silicates . . . . .	mg/L as Si . . . . .	E3370A . . . . .	10 . . . . .	0.02 . . . . .	0.1 . . . . .
Sodium . . . . .	µg/filt as Na . . . . .	E3146A . . . . .	50 . . . . .	0.1 . . . . .	0.5 . . . . .
. . . . .	mg/L as Na . . . . .	E3146A . . . . .	1 . . . . .	0.002 . . . . .	0.01 . . . . .
. . . . .	mg/L as Na . . . . .	E3171A . . . . .	20 . . . . .	0.02 . . . . .	0.1 . . . . .
. . . . .	mg/L as Na . . . . .	E3217A . . . . .	100 . . . . .	0.2 . . . . .	1 . . . . .
. . . . .	mg/L as Na . . . . .	E3249A . . . . .	4 . . . . .	0.005 . . . . .	0.025 . . . . .

# APPENDIX B

## W AND T VALUES FOR DATA REPORTED IN 1995

PARAMETER	UNITS	METHOD REFERENCE NO.	FULL SCALE	W	T
Solids, Dissolved	mg/L	E3188B	5000	2	10
Solids, Suspended	mg/L	E3365A	5000	2	10
Ignited (P. Ash/P. Loss on Ignition)	mg/L	E3188B	30000	0.5	2.5
Solids, Total	mg/L	E3365A	5000	1.0	5.0
Ignited (Ash and Loss on Ignition)	mg/L	E3188B	5000	0.5	2.5
Sulphate	mg/L or mg/Kg	E3188B	60000	2	10
	mg/L or mg/Kg	E3365A	2000	2	10
	mg/L	E3188B	50000	2	10
	mg/L as SO <sub>4</sub>	E3147A	10	0.05	0.25
	µg/filt as SO <sub>4</sub>	E3148A	(W40) 500	1.0	5.0
	µg/filt as SO <sub>4</sub>	E3148A	(Nylon) 250	1.0	5.0
	µg/filt as SO <sub>4</sub>	E3148A	(Teflon) 250	1.0	5.0
	mg/L as SO <sub>4</sub>	E3172A	100	0.5	2.5
	mg/L as SO <sub>4</sub>	E3372A	5	0.05	0.25
Sulphur Dioxide	µg/filt as SO <sub>2</sub>	E3148A	350	1.0	5.0
Turbidity	FTU	E3311A	2000	0.01	0.05
Zinc, Total	µg/L as Zn	E3376A	20	0.001	0.005



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TD/380/P47/1995/MOE